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SOUTHAM (C. M.) & EHRLICH (J.). **Etiology of some sap rots of Western Red Cedar poles.**—*Phytopathology*, 40, 5, pp. 439–444, 1950.

Among the fungi collected on peeled western red cedar (*Thuja plicata*) poles affected by brown sap rot in northern Idaho were *Merulius pinastri* [*R.A.M.*, 27, p. 302], *Poria vaillantii*, *Coniophora arida* [ibid., 17, p. 215], *C. olivacea* [ibid., 28, p. 98], *Paxillus panuoides*, *C. puteana*, *C. olivascens*, *Polyporus guttulatus* [ibid., 28, p. 348], *Corticium albostramineum*, and *Chaetomium funicola* [ibid., 29, p. 474]. *Fusarium roseum* [*Gibberella zeae*], *Pestalotia* sp., *P.* [or *Truncatella*] *hartigii* [ibid., 28, p. 489], and *Poria xantha* f. *crassa* were also available (in culture only).

The prevalence of contaminants and the thinness of the fructifications permitted the isolation of pure cultures from only a few specimens. Inoculation experiments with the 15 isolates tested resulted in the following average weight reductions: (?) *Coniophora puteana* 19·2 per cent., *C. arida* 7·3, (?) *Corticium albostramineum* 3·7, *Polyporus guttulatus* 53·8, *Poria vaillantii* 12, and (?) *M. pinastri* 1·1. The effects of *P. xantha* f. *crassa*, *Chaetomium funicola*, *G. zeae*, *Pestalotia hartigii*, and *P.* sp. were negligible.

From field observations and experimental data *Polyporus guttulatus* would appear to be concerned in the etiology of a brown cubical sap rot characterized in its early stages by a superficial, glossy, light yellow decay and known locally as 'golden glow'. Also associated with this phenomenon (thrice, twice, and once, respectively), were *Coniophora olivacea* and *C. olivascens* and *Corticium albostramineum*, but no etiological connexion was proved in regard to the first and second, while the third induced a spotty brown cubical decay of the test blocks. *C. puteana* and *C. arida* are responsible for the more familiar brown cubical rot, specimens of which also bore *Paxillus panuoides*, with which, however, no causal relationship could be established. The disorganization of the sapwood by *Poria vaillantii* proceeds slowly, accompanied by slight darkening in the early stages.

Forest products research, 1939–1947.—vii+94 pp., 10 pl., 1 fig., 4 graphs, 1 diag., Department of Scientific and Industrial Research, London, H.M. Stationery Office, 1950. 3*s.* 6*d.* net.

The publication comprises the combined Report of the Forest Products Research Board [cf. *R.A.M.*, 19, p. 316] for the years 1939 to 1945 inclusive (not previously published), together with those for 1946 and 1947.

In the Report on Mycology for 1939 to 1945 (p. 11) it is recorded that treatment with methylol urea increased the resistance of timber to decay [unspecified], but did not render it immune. In 1946 (pp. 26–27) it was established that some fungi can remain alive for three years [cf. ibid., 29, p. 392] in wood kept at a moisture content of about 12 per cent. In 1947 *Lenzites* cultures were still alive after four years at this moisture content and 25° C. Numerous requests were received from manufacturers for standard tests on their proprietary wood preservatives, and all the products submitted were tested according to British Standard Specification 838 [cf. ibid., 16, p. 290; 18,

p. 829]. The resistance to decay [unspecified] of wood treated with high concentrations of certain fire-proofing compounds was very much higher than that of untreated wood. The toxicity [to fungi] of a distillate from the alcohol extract from wallaba wood (*Eperua falcata*) was approximately equal to that of pure phenol. The presence of this material or its parent substance in the wood may be partly responsible for the high resistance to decay of this timber. Numerous samples from the Building Research Station of composite wallboards, floor blocks, and other synthetic building materials prepared from wood waste were tested against dry rot fungi [chiefly *Merulius lacrymans* and *Coniophora puteana*: cf. ibid., 25, p. 194]; when the binder used is a urea-formaldehyde resin and this is present in sufficient quantities, many of these materials show high resistance to decay.

At the Building Research Station a Norwegian method of sterilizing brickwork infested with *M. lacrymans* by means of a 3½ kw electric hot plate affixed to the wall was tested in co-operation with the Forest Products Research Laboratory. Blocks of wood infested with *M. lacrymans* were built into a 14-inch brick wall and examined for the presence of living fungus after the heat had been applied. Complete sterilization was effected in the area covered by the plate. At a cost of two to four shillings for electricity it is possible to sterilize 1 m. sq. of a 13½-in. wall, but the apparatus is very heavy and is awkward to fix. Experiments were carried out to determine whether 'hubbelite' magnesium oxychloride cement, which contains finely divided copper, could be used as a method of sealing the surface of brickwork infested by *M. lacrymans*. Heavily infested wood blocks were coated with a thin layer of hubbelite, controls being coated with ordinary Portland cement and sand. After several weeks in a damp chamber the fungus grew out from the controls, but no growth appeared on the hubbelite-treated blocks. As finely divided copper is not readily obtainable, tests are to be made to determine whether zinc oxychloride cement is equally effective.

Work on the metabolic products of wood fungi in co-operation with the Biochemistry Department of the London School of Hygiene and Tropical Medicine was continued in 1947 [cf. ibid., 29, p. 223]. Interesting products of *Polyporus benzoinus* are being examined. The ester responsible for the 'pear-drop' odour of species of *Endoconidiophora* was provisionally identified as isopropyl acetate.

Eades (H. W.) & Roff (J. W.). **Sap stain and mould prevention—the relative efficacy of certain chemicals.**—*Mimeo For. Prod. Lab. Can.* V–1007, 8 [+8] pp., 1 fig., 1950. [Mimeographed.]

In an experiment carried out in British Columbia in June, 1948, to compare the control of sap stains and mould in stored timber given by six chemical dips [cf. *R.A.M.*, 20, p. 1], approximately 5,600 board ft. of western white pine [*Pinus monticola*], Douglas fir [*Pseudotsuga taxifolia*], and western hemlock [*Tsuga heterophylla*] were placed in a tight pile 24 hours after treatment, under optimum conditions for fungal growth, along with 1,400 board ft. of the same species untreated. As each course of the pile was completed it was sprayed with a spore suspension of *Trichoderma*, *Penicillium*, and *Ceratostomella* spp. After two months the material was re-piled in reverse order for a further two months' exposure. A second and smaller test was made in August with a seventh fungicide. The proprietary compounds tested were water-soluble powders, of which (1) contained sodium pentachlorophenate, (2) sodium tetrachlorophenate, (3) sodium pentachlorophenate and borax, (4) a sodium pentachlorophenate salt and borax, (5) ethyl mercury phosphate and a warning agent, and (7) ethyl mercury phosphate and pentachlorophenate salts; compound (6) was a liquid complex substituted ammonia ester of an organic acid. The untreated timber of the three species had 11 to 46 per cent. of the boards free from fungal stain and moulds after four months; the corresponding percentages for the fungicides were (1) 90 to 100, (2) 87 to 96, (3)

79 to 94, (4) 77 to 87, (5) 27 to 69, and (6) 8 to 18. Preventive (7) gave only fair protection.

Under the very severe conditions of the test, Nos. 1 to 4 were satisfactory. In the hold of a ship they should prove adequate if the lumber is given some air-seasoning before shipment. All four are poisonous and likely to prove injurious unless handled carefully.

Treatment of sawdust insulation for protection against mold, decay, insects, rodents, and fire.—*Rep. For. Prod. Lab., U.S. Dep. Agric.* R1092 (revised), 4 pp., 1949. [Mimeographed.]

Dry sawdust and planer shavings, frequently used in walls for heat insulation, can be effectively protected against [unspecified] mould and decay by mixing with each 100 lb. of the air-dry materials about 15 gals. of a solution containing either (1) 3 lb. sodium fluoride and 5 lb. borax, or (2) 5 lb. monoammonium phosphate, 5 lb. borax, and 3 lb. sodium fluoride. After treatment the material should be thoroughly dried.

THEDEN (GERDA). **Betrachtungen über die Laboratoriumsprüfung der pilzwidrigen Wirksamkeit von Holzschutzmitteln.** [Observations on laboratory testing of the fungicidal efficacy of timber preservatives.]—*NachrBl. dtsch. PflSch Dienst (Berl.)*, N.S., **2**, 1–2, pp. 11–15, 4 figs., 1948. [Received June, 1950.]

Using the wood block method [*R.A.M.*, **15**, p. 546; **25**, p. 376; **27**, p. 209], the fungicidal threshold (the concentration at which a material begins to be fungicidal) was determined for various wood preservatives. Mercuric chloride was the most fungicidal, the threshold being 0·0075 per cent. against *Lenzites abietina*, 0·02 to 0·03 against *Poria vaporaria*, and 0·04 to 0·05 against *Coniophora cerebella* [*C. puteana*] and *P. contigua*. Potassium arsenate was next, the values being 0·01 per cent. for *C. puteana*, 0·04 for *P. vaporaria*, and 0·2 to 0·3 for *P. contigua*; those for sodium fluoride were 0·05 per cent. for *P. vaporaria*, 0·1 for *L. abietina*, 0·15 for *C. puteana*, and 0·2 to 0·3 for *P. contigua*; and for zinc chloride 0·15 to 0·75 per cent. for most of the test fungi.

The testing of 11 other fluoride compounds against *C. puteana*, *P. vaporaria*, *L. abietina*, and *P. contigua* showed that the threshold values ranged from 0·04 to 0·3 per cent. A comparison of sodium fluoride and commercial products containing mainly this material gave fairly consistent results, with only negligible fluctuations. Comparisons between various fluosilicates and commercial salts containing these materials gave similar results, but fluctuations were considerable in the case of commercial liquid materials containing chiefly fluosilicates.

For practical purposes the threshold concentration must be increased at least five times.

RENNERFELT (E.). **The effect of soil organisms on the development of Polyporus annosus Fr., the root rot fungus.**—*Oikos*, **1**, 1, pp. 65–78, 1 fig., 2 graphs, 1949.

Of 118 soil-inhabiting fungi and bacteria of various ecological groups tested at the Forest Research Institute of Sweden for their antibiotic effects on malt extract agar cultures of *Polyporus* [*Fomes*] *annosus*, the agent of spruce root rot [*R.A.M.*, **29**, p. 524], *Aspergillus niger*, *Penicillium claviforme*, *P. echinatum*, and *P. luteo-viride* exerted a strongly inhibitory action (>5 mm.) on the growth of the parasite, while a weaker one (<5 mm.) was exercised by *Coniophora puteana*, *Clitocybe nebularis*, *A. fumigatus*, *P. purpurogenum*, and *P. spinulosum*. *F. pinicola* and *Trichoderma viride* overgrew *F. annosus*, while the latter overran *Polyporus* [*F.*] *fomentarius*, *Ophiostoma* [*Ceratostomella*] *piceae*, *O.* [*C.*] *pini*, and *Pullularia pullulans*, and inhibited the development of an undetermined Phycomycete and *Corticium investiens*.

The powerful antagonism of *Penicillium claviforme* is attributable to the operation of clavacin [ibid., 23, p. 267; cf. also 27, pp. 203, 488], which inhibits conidial germination in *F. annosus* at a dilution of approximately 25 p.p.m. Of the five nutrient solutions in which the mycelium of *P. claviforme* was grown, Czapek-Dox afforded the strongest stimulus to antibiosis, requiring to be diluted 64 times before the conidia of *F. annosus* could even begin to germinate.

Campbell (W. A.), Miller (J. H.), & Thompson (G. E.). **Notes on some wood-decaying fungi of Georgia.**—*Plant Dis. Reptr*, 34, 5, pp. 128–134, 1950. [Multilithed.]

A list is presented of wood-decaying and wood-inhabiting fungi (belonging to seven families) found in Georgia, made from recent and past collections in the herbarium of the Department of Plant Pathology, University of Georgia.

Pelczar (M. J.), Gottlieb (S.), & Day (W. C.). **Growth of Polyporus versicolor in a medium with lignin as the sole carbon source.**—*Arch. Biochem., N.Y.*, 25, 2, pp. 449–451, 1950.

It has recently been shown by experiments at the University of Maryland that *Polyporus* [*Polystictus*] *versicolor* is capable of growth in a synthetic liquid medium with 0·5 per cent. native lignin as the sole source of carbon [cf. *R.A.M.*, 28, p. 477]. Development under these conditions was practically equal, judged by the diameter of the mats of three cultures after seven days (5, 6, and 5 cm.), to that obtained in the presence of the same amount of glucose (5·5, 6, and 5·5). This is stated to be the first demonstration of the cultivation of a fungus in a synthetic liquid medium in which carbon was supplied exclusively by isolated native lignin. Of interest, too, is the comparative rapidity of the growth rate (one to two weeks) in contrast to the longer periods generally reported for wood and other lignin-containing media. Unlike some other white rot fungi tested [ibid., 29, p. 393], the three strains of *P. versicolor* under investigation required no previous adaptation to the lignin medium.

Birkinshaw (J. H.) & Morgan (E. N.). **Biochemistry of the wood-rotting fungi. 6. Volatile metabolic products of species of Endoconidiophora.**—*Biochem. J.*, 47, 1, pp. 55–59, 1950.

Endoconidiophora coerulescens [*R.A.M.*, 24, p. 37], grown on a liquid malt medium, gave rise to the volatile metabolic products *iso*butyl acetate, 2-methylhept-2-en-6-one, and a mixture of L- and DL-methylhept-2-en-6-ol. On the same substratum *E. virescens* [loc. cit.] produced the same methylheptenone and mixture of L- and DL-methylheptenol as *E. coerulescens*, but in different proportions. No *iso*butyl acetate was detected in the former species. *E. fimbriata* yielded no identifiable volatile metabolic products under the conditions of these experiments. The characteristic odours emanating from the fungi in culture, namely, banana oil (amyl acetate) in the case of *E. coerulescens* and musty and penetrating in that of *E. virescens*, are attributed to the presence of the volatile metabolic products.

Harrow (K. M.). **Effect of final vacuum on kickbacks in Pinus radiata and P. laricio treated by an empty-cell method with an aqueous solution.**—*N.Z. J. Sci. Tech.*, B, 30, 3, pp. 195–197, 1948. [Received March, 1950.]

A common commercial practice in timber preservation by pressure impregnation is to remove excess solution from the timber by creating a vacuum in the pressure cylinder following the emptying of solution after treatment. In the writer's experience (*N.Z. J. Sci. Tech.*, B, 29, pp. 153–163, 1947), however, this practice did not appear to be warranted, and in tests carried out on *Pinus radiata* and

P. laricio boards, 5 by 1 in., it was found that at the end of 24 hours the kick-back from boards subjected to an hour's final vacuum after impregnation with 2 per cent. boric acid was identical with that from those allowed to drain at atmospheric pressure [cf. *R.A.M.*, 29, p. 70].

VERRALL (A. F.) & SCHEFFER (T. C.). **Control of stain, mold, and decay in green lumber and other wood products.**—1949 Preprint, Forest Products Research Society, 9 pp., 6 figs., 1949.

Chemical treatments based on the use of chlorinated phenols and organic mercurials, alone or mixed or in combination with borax or soda, have been successfully used in the United States for dipping or surface treatment of lumber to prevent mould, stain, and [unspecified] fungal decay damage during seasoning and storage. The chemicals recommended as log sprays to control fungi for 3 to 4 months are borax (32 lb. to 100 gals. water) and dowicide H (6 to 100), which are effective on hardwoods only, and lignasan plus dowicide G or santobrite (1:4 to 100) and the same plus borax (6 lb.), which have proved particularly effective under severe conditions. Where dowicide G and santobrite are used for dipping precautions must be taken to protect workers' hands. Freshly cut timber is best kiln-dried promptly. Economical chemical surface treatments have been developed for air-seasoned timber, which are effective only for the short period necessary for seasoning. Timber to be dipped should be stain-free, promptly treated the day it is sawn in solutions of the correct concentration, and completely immersed. Notes are given on the seasoning of pile covers, foundations, and alignment and spacing of boards. Chemical dips may also be used to protect such products as veneer, staves, hoops, and shingles.

MAHMUD (K. A.). **Root rot of Radish caused by Pythium aphanidermatum (Eds.) Fitz.**—Reprinted from *Allahabad Fmr*, 24, 2, 2 pp., 1950.

A root rot of radish seedlings caused by *Pythium aphanidermatum* [*R.A.M.*, 5, pp. 72, 216] is reported, with a morphological description of the fungus, from the Agricultural Research Institute, Nagpur, this being the first record of its occurrence on radish in India [cf. ibid., 11, p. 545]. All the seedlings grown in pots on autoclaved soil infested by the pathogen contracted the disease within a fortnight of germination.

SCHUSTER (M. L.). **A genetic study of halo blight reaction in Phaseolus vulgaris.**—*Phytopathology*, 40, 6, pp. 604–612, 1 fig., 1950.

Studies on the mode of inheritance of bean (*Phaseolus vulgaris*) halo blight (*Pseudomonas medicaginis* var. [f. sp.] *phaseolicola*) and its association with plant characters were carried out at the Nebraska Agricultural Experiment Station [*R.A.M.*, 23, p. 468]. Disease reaction was found to be governed by one or two factors, depending on the susceptible and resistant parents used, susceptibility being dominant. Crossed with the susceptible U.S. No. 5 Refugee, the resistant Mexican Red and Arikara Yellow indicated a monofactorial type of inheritance, the former parent possessing homozygous dominant genes SS for susceptibility and the latter parents homozygous recessive genes ss for resistance. From the F_2 progeny of the cross between Mexican Red and the susceptible Asgrow Stringless, however, a bifactorial mode would appear to operate, the susceptible parent possessing two dominant factor pairs S_1 S_1 S_2 S_2 for susceptibility. The resistance of the F_1 from Mexican Red × Asgrow Stringless is attributed to the age of the host tissue. Response to halo blight was not correlated in inheritance with flower colour, stringiness of pods, or determinate or indeterminate growth habit, and individuals combining resistance with other acceptable characters could probably be developed with little difficulty.

Gaskill (J. O.). **Drying after harvest increases storage decay of Sugar-Beet roots.**—*Phytopathology*, 40, 5, pp. 483–486, 2 figs., 1950.

In an investigation at the Colorado Agricultural Experiment Station to verify observations by the author and others as to the tendency for wilted sugar beets to decay as a result of invasion by *Phoma betae* and other fungi more extensively in storage than unwilted ones, 16 samples of freshly harvested roots (18 or 19 per sample) were washed, weighed, and dried out-of-doors in direct sunlight for one, two, and four days, and (as a check) half-an-hour. During these periods the losses in weight were 6, 9·9, 15·4, and 0 per cent., respectively. These samples, representing in quadruplicate the four drying periods, were stored in wooden boxes, which were distributed in two ventilated rooms, in one of which the temperature was maintained at 45° F. and in the other at 65°. Relative humidity was adjusted to a sufficiently high level to prevent excessive loss of weight from evaporation in sound tissue. After about three months' storage at 65° and 4½ at 45°, the percentage of decay in each sample was determined by weighing the rotted and healthy tissue. The percentage losses in weight during storage at 65° and 45° were as follows: one day drying 12·9 and 0·9, two days 18·7 and 2·6, four days 26·1 and 3·5, and control 11·7 and 2·8, the corresponding percentages of rotted tissue at the end of storage being 31·9 and 11·4, 65·6 and 27·3, 87·5 and 34·2, and 11·8 and 4·3, respectively. These data emphasize the urgency of prompt removal of beets from the field after harvesting.

Hull (R.). **Virus yellows : need for healthy stecklings.**—*Brit. Sug. Beet Rev.*, 18, 3, pp. 107–111, 118, 2 figs., 1950.

Figures supporting the statement that the general level of beet virus yellows in Great Britain [*R.A.M.*, 29, p. 240] has increased since 1946 are presented in tabular form. They are based on counts made by the agricultural staff of the British Sugar Corporation in sample fields in factory areas in six beet-growing districts, the mean percentages of infection in June, July, August, and September being given. The September counts for the north (Yorkshire and Scotland), East Midlands, Fenland, East Anglia, Home Counties and south, and west in 1946 were 6·6, 11·4, 11·4, 9·8, 9·2, and 6, respectively; in 1947, 3·8, 16, 21·2, 42·9, 3·3, and 2·4; in 1948, 15·4, 37·5, 31·8, 17·9, 12·1, and 28·5; and in 1949, 20·5, 66·1, 81·8, 69·7, 40·2, and 35·7.

From a series of experiments it was ascertained that 4 to 5 per cent. of the sugar yield is lost for every week a plant shows yellows symptoms up to mid-October. At this rate, taking 4·5 per cent. as an average, the loss of yield on plants infected at the end of September is 9 per cent. and at the corresponding periods of August, July, and June 31·5, 49·5, and 67·5, respectively. Using this method of calculation in conjunction with the disease counts in sample fields throughout the country, the losses in 1946 are computed roughly at 120,000 tons at 16 per cent. sugar content, in 1947 at 139,000 tons, in 1948 at 388,000, and in 1949 at 915,000.

Virus yellows causes only a modest reduction in sugar content, usually less than 2 per cent. It lowers the yield of tops, and the yellow, necrotic leaves do not remain fit for fodder as long as healthy ones. Infection is accompanied by a slight increase in noxious nitrogen and a decrease in root juice purity, involving the production in the factory of more molasses and less sugar. Thus, in a test in 1946 comparing 75 pairs of healthy and infected plots, the sugar yields per acre were 27·21 and 14·65 cwt.; roots 8·89 and 5·04 tons; sugar content 15·28 and 14·47 per cent.; tops 14·10 and 10·85 tons; noxious nitrogen 50·75 and 56·15 mgm.; and purity 85·99 and 84·92.

Mangolds are also susceptible to virus yellows and sustain a reduction of dry matter comparable to that of sugar beet. The disease further takes a heavy toll of both sugar and fodder beet seed crops. An average crop on good silt land in south

Lincolnshire produces about 16 cwt. seed per acre, whereas the potential yield of a healthy crop is about 2 tons. No regular survey of seed crops has been made, but for the last two years none in a certain area of Lincolnshire contained less than 80 per cent. virus yellows. If this is representative of other districts, complaints of poor yields are not surprising. The best method of combating the disease in seed crops is to raise the stecklings in relatively aphid-free areas at a distance from other sugar beet or mangold crops. In a co-operative trial of the British Sugar Beet Seed Producers' Association in 1948–9, the incidence of virus yellows in Scotland and northern England, Wales, East Anglia, and Essex and Gloucestershire was 0·25, 2·63, 94·34, and 0·87 per cent., respectively, and the corresponding seed yields 22·8, 22·2, 14·7, and 22·7 cwt. per acre. Some of the stecklings raised in isolation were grown commercially in south Lincolnshire, where the contrast with the locally cultivated plants was very striking. In one area the growers of the imported stecklings obtained an average yield of 25 cwt. per acre as against 11 cwt. from the locally grown.

Clamps should be covered with a 6- to 8-in. layer of soil (or more if severe frosts threaten). In East Anglia, stecklings sown in June and July are more liable to virus yellows than August sowings, though in some years up to 80 per cent. infection may occur even among those sown at the end of the latter month. Infection tends to be heavier on thin, 'gappy' beds than in dense stands, and narrow rows (9 to 12 in.) should be used wherever practicable. For several years a reduction in virus yellows has been secured by sowing in April in a barley or linseed cover crop. Encouraging results were obtained in 1948–9 in spraying tests with systemic insecticides for aphid control, but further experiments must be undertaken before recommending this practice for general use. No doubt one of the chief reasons for the increased severity of virus yellows is the indiscriminate intermingling of a large acreage of sugar and fodder beets with some 8,000 acres of seed crops in areas naturally congenial to the aphid vectors. The latter overwinter in mangold [ibid., 28, p. 370] and red beet clamps and are largely responsible for the establishment and spread of spring outbreaks. Roots should be topped before clamping to dispose of the aphid-infested leaves.

Elmore (J. C.). **A device for spraying Bean seed in the row while planting.**—*B.E.P.Q., U.S. Dep. Agric.*, ET–279, 3 pp., 4 figs., 1950. [Mimeoprinted.]

An attachment to slide over the heel of the boot of a Lima bean [*Phaseolus lunatus*] seed planter sprays the seed and soil at sowing. Developed in southern California, the device consists of a commercial nozzle screwed on to a 3-in. length of $\frac{1}{4}$-in. bent iron pipe, which is welded along its lower half to a 3 in.-split length of $1\frac{1}{2}$-in. pipe each side of which is fitted with metal flanges (2 by 3 in.) to act as baffles. A rubber hose connects the attachment with the sprayer. A nozzle tip delivering 0·3 gals. per min. at 40 lb. pressure has been found most satisfactory. Spray angles ranged from 15° to 80° and the tip is provided with interchangeable filters of 50- or 100-mesh screen.

Zaumeyer (W. J.) & Thomas (H. R.). **Bean diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1692, 38 pp., 23 figs., 1950.

This bulletin on the symptoms, causes, and control of the more important bean [*Phaseolus vulgaris*] and Lima bean [*P. lunatus*] diseases in the United States is a revised edition of one already noticed [*R.A.M.*, 12, p. 1; see also ibid., 24, p. 260]. Sections are devoted to control practices in general, the use of resistant varieties and disease-free seed, rotation, field sanitation, and seed treatment. In addition to the diseases dealt with in the earlier edition the following on *P. vulgaris* are included: watery soft rot or white mould (*Sclerotinia sclerotiorum*) [ibid., 28, p. 45; 29, p. 452], root rots (mainly due to *Rhizoctonia* [*Corticium*] *solani*, *Fusarium solani*

f. *phaseoli* [loc. cit.], *Pythium butleri* [*P. aphanidermatum*: ibid., 29, p. 452], *Sclerotium rolfsii* [cf. ibid., 11, p. 218; 27, p. 65; 28, p. 471], web blight (*R. microsclerotia*) [ibid., 19, p. 3], baldhead, due to mechanical injury to the seed, and sunscald; and on *P. lunatus*: bacterial blights (*Xanthomonas phaseoli*) [ibid., 28, p. 26], *Pseudomonas* [*medicaginis* f. sp.] *phaseolicola* [ibid., 28, p. 614], *P. syringae* [ibid., 26, p. 41], and stem anthracnose (*Colletotrichum truncatum*) [ibid., 27, p. 306]. A final section deals with the effects of these diseases in transit and storage.

Dry bean varieties resistant to both curly top and bean mosaic viruses are Red Mexican U. I. Nos. 3 and 34, Great Northern U.I. Nos. 16 and 31, and Pinto U.I. Nos. 72, 78, and 111.

SMITH (W. L.). **Seed treatment with streptomycin for the control of bacterial blight of Beans.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 49, 1949.

At the University of Wyoming the aqueous solutions of the sulphate and hydrochloride salts of streptomycin were tested for their inhibitory action on the seed-borne bacterial blight (*Pseudomonas medicaginis* var. [f. sp.] *phaseolicola*) of beans [*Phaseolus vulgaris*: *R.A.M.*, 28, p. 513 and next abstract]. Seed of the Sensation Refugee variety was planted in three replications in greenhouse sand benches in lots of 100 seeds per treatment. Disease readings were made from 10 to 12 days after planting. One hour's treatment resulted in complete control at all dilutions except the 1 in 1,000. After 15 minutes' treatment plants from the 1 in 500 dilution showed a trace of blight, while the 1 in 100 eliminated infection entirely. Streptomycin was equally effective when as many as 12 lots of seed were immersed consecutively in the same solution. The plants also remained free from blight when planting was postponed for up to 32 days after treatment, and for six weeks after planting. The untreated lots in the various tests contracted 7 to 33 (average 25) per cent. infection.

BURKE (D. W.) & STARR (G. H.). **Studies on bacterial wilt of Beans caused by Bacterium flaccumfaciens.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 49, 1949.

An intensive study was conducted in northern Wyoming during the late summer of 1948 to determine the prevalence of bacterial wilt (*Bacterium* [*Corynebacterium*] *flaccumfaciens*) of bean [*Phaseolus vulgaris*: *R.A.M.*, 25, p. 476] and its connexion with common and halo blights (*Xanthomonas phaseoli* [ibid., 29, p. 345] and *Pseudomonas medicaginis* var. [f. sp.] *phaseolicola* [see preceding abstract], respectively). The bacterial colonies isolated from diseased plants of 34 commercial and 19 snap bean varieties were stained and examined microscopically with the following results. Collections from 19 fields yielded only *C. flaccumfaciens*, from ten *X. phaseoli* alone, and from nine (snap beans) only *P. m.* f. sp. *phaseolicola*. In 12 cases *X. phaseoli* and *C. flaccumfaciens* were isolated from the same plant material and three snap bean collections yielded cultures of the same two species, while one Great Northern collection harboured bacteria of all three types. Wilt-diseased plants produced more yellow seed than those infected by *X. phaseoli*. Cultures of *C. flaccumfaciens* and *X. phaseoli* were similar, but the former generally grew more slowly and were less glossy and viscous. The majority of the cultures were Gram-positive.

GRAHAM (R. W.). **Preliminary studies on the use of insecticides for controlling Colorado red node.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, pp. 40–41, 1949.

A test plot established at Grand Junction, Colorado, in the summer of 1948 to determine the possibility of combating the [bean, *Phaseolus vulgaris*] red node [virus: *R.A.M.*, 29, p. 488] was divided into three sections, viz., (1) untreated, (2) sprayed with basic copper arsenate plus triton (B 1956), and (3) sprayed with basic copper arsenate plus DDT plus nicotine sulphate plus triton. The treatments

were applied at ten-day intervals. The best results were obtained on plot (3), where the control of sucking insects, as well as of mandibulate, reduced the incidence of infection by some 75 per cent. in comparison with plots (1) and (2).

Beach (W. S.). **Control of Mushroom diseases and weed fungi.**—*Bull. Pa St. Coll.* 351, 32 pp., 6 figs., 1937. [Received May, 1950.]

Most of the information in this bulletin has been noted from another source [*R.A.M.*, 17, p. 791]. The fungi listed in addition to those already noted are *Mycogone perniciosa*, *Verticillium* sp. [*V. malthousei*: ibid., 29, p. 292], *Dactylium dendroides*, *Fusarium* spp. [ibid., 29, p. 196] causing damping-off, *Pseudobalsamia microspora*, *Myriococcum praecox* [ibid., 16, p. 653], *Pleurotus passeckerianus*, and *Trichoderma* and *Penicillium* spp. The author has made revisions as follows. A temperature of 140° F. is necessary to kill harmful fungi in compost. Diseased areas should be sprayed after the good mushrooms have been picked with 1 to 50 dilution of formaldehyde and covered with heavy paper for a day. The area should be allowed to dry and aerated for a week before being watered again.

Mushroom and Mushroom spawn production in Scotland.—*Food Manuf.*, 24, 6, pp. 253–255, 4 figs., 1949.

An account is given of the methods employed at the Scottish Mushroom Laboratories, Hogganfield, Glasgow, in the production of mushrooms and mushroom spawn. Two new types of spawn are being developed, one grown on a compost of tobacco stems, the other on grain. Experimental data indicate that spawn grown on these media will run thicker and faster than the present type, resulting in a quicker crop with less time for invasion of the beds by disease. A new culture has been obtained which it is hoped will give a finer strain of mushrooms than any of the present varieties. Over 60 per cent. of the spawn produced at Hogganfield is exported, mostly to France, Belgium, Holland, Switzerland, and Eire.

Hewitt (W. B.). **Fanleaf—another Vine disease found in California.**—*Bull. Dep. Agric. Calif.*, 39, 2, pp. 62–63, 1 col. pl., 1950.

The vine disease closely resembling the infectious degeneration type of court-noué first observed in California in 1948 [*R.A.M.*, 29, p. 455] has now been discovered in the Napa Valley. Affected vines leaf out a few days late. Shoot nodes are usually close together, and the shoots in the early stages of growth are spindly and tend to zigzag at the nodes. The leaves are generally small and when the shoots are four to ten inches long the leaves tend to stand upright along the shoot axis and to cup slightly in from the sides to the centre of the upper leaf surface, leaving the midrib and other veins standing out conspicuously. As the leaves age they assume a more normal position. Leaves on young shoots at the base of canes display varying amounts of deformity and a variegated mottling, especially in the palm, near the point of petiole attachment. The petiolar sinuses of the malformed leaves spread out and the margins straighten or even bend up; the angle of the sinus opening may exceed 200°. The condition is termed 'fan leaf' because the five main veins of affected leaves gather together towards the midrib in the form of a partially closed fan. Different veins or combinations of veins may be gathered together, the leaves becoming lop-sided. The veins usually stand out prominently on young leaves and become less pronounced as the leaves age; they are also slightly translucent. When young some deformed leaves display irregular patterns of dark and light green mottling; the darker areas tend to bulge or pucker upwards and are usually thicker than the lighter areas. As the leaf ages the mottling becomes less distinct and the whole leaf turns dark green. The nodes of some canes may be enlarged, and some may develop two or more buds. Excessive production of secondary or lateral shoots also appears to be typical. Diseased vines are less

fruitful than normal ones and the blossom clusters shell during bloom, leaving straggly clusters. In mid- and late season apparent recovery occurs.

KAREL (G.). **Bağlarımızda 'bulaşıcı soysuzlaşma' meselesi.** [On the problem of infectious degeneration in our vineyards.]—*Mahsul Hekimi* (*Plant Prot. J.*), 3, 7, pp. 157–159, 1950. [Turkish, with English summary.]

The 'infectious degeneration' form of vine court-noué [cf. preceding abstract] has not been found in Turkey, where symptoms resembling the condition are due to damage by *Phyllocoptes* sp. and *Phylloxera vastatrix* [f. *radicicola*] or to metabolic disturbances.

HEWITT (W. B.). **Grapevine mosaic.**—*Bull. Dep. Agric. Calif.*, 39, 2, p. 61, 2 col. pl., 1950.

Vine mosaic (virus) [*R.A.M.*, 27, pp. 355, 465; 28, p. 157; 29, p. 137] is becoming increasingly prevalent in young vineyards in California, especially among wine grape varieties. Spread appears to occur through buds or scion wood from affected vines and through rootstock propagating wood from diseased mother vines. The best method of preventing spread consists in selecting, propagating, and planting only clean, healthy stock.

QUANJER (H. M.) & THUNG (T. H.). **International Committee on Nomenclature and Classification of Plant Viruses.**—*Tijdschr. PlZiekt.*, 56, 4, pp. 286–287, 1950. [Dutch, with English summary.]

A questionnaire was addressed by the Committee on Nomenclature and Classification of the American Phytopathological Society in the autumn of 1949 to 190 specialists on plant viruses to ascertain whether they preferred the numbering system of virus classification, originated by J. Johnson [*R.A.M.*, 6, p. 501] and modified by K. M. Smith [ibid., 17, p. 52], or Holmes's binomial scheme [ibid., 28, p. 514]. Replies were received from 121 workers, of whom 80 and 39, respectively, were in favour of the binomial and numbering systems, and two expressed no preference. A similar circular to 22 virus specialists in Holland by the International Committee on Nomenclature and Classification of Plant Viruses elicited 18 responses, of which 14 favoured the numbering system, two the binomial, and two were indifferent. The authors suggest that the question of virus nomenclature should be left open for the present.

USCHDRAWEIT (H. A.). **Der heutige Stand der Erforschung pflanzlicher Viruskrankheiten.** [The present status of research on plant virus diseases.]—*Ber. dtsch. bot. Ges.*, 62, 4, pp. 87–99, 4 figs., 1950.

Up-to-date information on plant virus diseases is presented and discussed, in the light of the author's studies in Germany and of the relevant contemporary literature, under the headings of history, definition, symptoms, transmission, physico-chemical properties, physiology, nomenclature and classification, nature of viruses, and control.

LINDNER (R. C.), KIRKPATRICK (H. C.), & WEEKS (T. E.). **A simple staining technique for detecting virus diseases in some woody plants.**—*Science*, 112, 2900, pp. 119–120, 1 fig., 1950.

A technique is described for staining phenolic compounds, distributed in patterns characteristic for a given virus, in cleared leaf tissue. The procedure is used for whole leaves or sections of leaves, petioles, stems, and roots. The chlorophyll is removed and the polyphenols fixed by boiling under a condenser or heating in a water bath at 80° C. in a solution of 700 ml. of 95 per cent. ethyl alcohol, 20 ml. of 37 per cent. formaldehyde, and 230 ml. of distilled water. One or two changes

of the reagent may be necessary. The samples are transferred to normal sodium hydroxide and heated at 80° to 100° until maximum deep blue colour develops, usually from 2 to 10 minutes. The blue colour oxidizes to red in 5 to 10 minutes when exposed to air or changes to red on acidification. Treated tissue may be placed in lactic acid if it is to be kept for any time.

The method is applicable only to those plants which have a polyphenol system similar to that present in deciduous fruit trees [*R.A.M.*, 29, p. 312] and is useful in detecting and studying what appears to be virus movements and distribution. Genetic variegations and virus-like symptoms caused by chemicals have failed to give a stain reaction.

List of intercepted plant pests, 1948.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 58 pp., 1950.

Among the pathogens on plant material intercepted on entering the United States from 1st July, 1947, to 30th June, 1948 [cf. *R.A.M.*, 28, p. 608], were 172 arriving by air. Approximately half of these were not determinable as to species but they did not appear serious. The disease-carrying possibilities of plant materials brought in by air transportation are emphasized. The more important organisms, intercepted in cargo and baggage arriving by air, not believed to be established in the United States were *Ascochyta citri* on oranges from Italy and the Azores, *Gloeosporium olivarum* on olive from Italy, *A. decipiens* [*Diplodia passerinii*] on snapdragon [*Antirrhinum majus*: ibid., 20, p. 468], and *Stagonospora ilicis* on holly from England, *Cercospora angraeci* on orchid (*Odontoglossum* sp.) and *Coniothyrium diplodiella* [? *C. fuckelii* stat. conid. of *Leptosphaeria coniothyrium*] on rose from France, *Coleosporium dahliae* on *Dahlia*, *Cytospora lirella* on bamboo, and *Uredo behnickiana* on orchid (*Laelia* sp.) from Mexico, *Elsinoe phaseoli* on Lima bean [*Phaseolus lunatus*] from Puerto Rico [ibid., 10, p. 578], *Phyllosticta cymbidii* on *Cymbidium* orchid from Japan, *P. odontoglossi* on *Stanhopea* orchid from Panama and Costa Rica, and *U. scabies* on *Vanilla* orchid cuttings from Nicaragua. The last-named would have gone straight to Puerto Rico for commercial purposes and it is the first record of the fungus north of South America.

There have been fewer interceptions of citrus canker (*Xanthomonas citri*) from India and Ceylon since 1945 but the largest number in 1947–8 were from India, and the second largest from the Philippines [ibid., 22, p. 176]. *Elsinoe australis* was taken five times on lemons from Argentina, Brazil, and Paraguay, seven times on oranges from Argentina and Brazil, and once on an unidentified citrus fruit from Brazil [ibid., 27, p. 352]. *Coleosporium senecionis* on *Senecio deferens* was intercepted from Argentina [cf. ibid., 23, p. 156; 28, p. 218].

Other diseases include *A. fraxini* on ash from Italy; *Colletotrichum lilii* [ibid., 26, p. 339] on various species of lily buds from Australia, China, India, and Japan; *Cryptospora longispora* on pine from New Zealand; *E. piri* on pear from the U.S.S.R.; *Helminthosporium carposaprum* on chilli and tomato from Mexico [ibid., 26, p. 175]; *Heteropatella valtellinensis* on carnation from Canada [ibid., 27, p. 555]; *Monilia* [*Sclerotinia*] *fructigena* on apple from Sweden; *Mycosphaerella hondai* on rice from China and Japan; *Phomopsis magnoliae* on magnolia from the Netherlands; *Phyllachora balansiae* on *Cedrela* sp. from Panama [cf. ibid., 27, p. 542]; *P. cynodontis* on Bermuda grass [*Cynodon dactylon*] from India; *Plowrightia* [*Dothidea*] *virgultorum* on European white birch [*Betula pendula*] from Sweden [cf. ibid., 10, p. 272]; *Puccinia longicornis* on bamboo from China [cf. ibid., 13, p. 656]; *Sclerotinia kerneri* on silver fir [*Abies alba*] from Germany [cf. ibid., 22, p. 176]; Australian citrus scab (*Sphaceloma fawcettii* [var.] *scabiosa*) on lemon from Australia [ibid., 23, p. 251]; *Sphenospora kevorkianii* [cf. ibid., 24, p. 60] on *Stanhopea* sp. from Ecuador; *U. ignava* on bamboo from China and an unknown source; *Uromyces bacumerlianus* on sweet clover [*Melilotus officinalis*] from Egypt, and *Ustilago kenjiana* [ibid., 15, p. 829] on sorghum from Arabia.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1947. Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1948.** [Observations and researches carried out at the State Phytopathological Station during the year 1947. Observations and researches carried out at the State Phytopathological Station during the year 1948.]—*Bull. Inst. agron. Gembloux*, 17 (*1948–1949*), pp. 181–189, 190–200, [? 1950].

In the second of these reports [cf. *R.A.M.*, 29, p. 145] on the incidence of plant pathogens recorded during the period it is stated that during 1948 *Cercosporella herpotrichoides* [ibid., 26, p. 387; 29, p. 247] was very prevalent on wheat in Belgium, causing heavier damage than the year before; barley and winter barley were also widely attacked, notable losses being sustained. Poplar canker due to *Botryodiplodia penzigii* [ibid., 18, p. 68], not previously recorded in Belgium, was found. There was no further spread of *Diplodia quercina* on oak [ibid., 28, p. 40]. A few cases of *Lophodermium macrosporum* were observed on spruce [ibid., 18, p. 218]. Asters [*Callistephus chinensis*] were frequently attacked by cucumber virus 1 [cucumber mosaic virus].

Plant diseases.—*Agric. Gaz. N.S.W.*, 61, 4, pp. 189–192, 4 figs.; 5, pp. 245–246, 248, 4 figs., 1950.

During 1936–7, frost damage to wheat [*R.A.M.*, 28, p. 169] was so widespread in southern and central New South Wales that tens of thousands of acres had to be cut for hay. Two years later it reduced by an estimated average of 25 per cent. the yield in both northern and southern sections of the wheat belt. In 1939–40 and 1946–7 losses from frost injury were greater than those from all other causes combined, while in 1945–6 they varied from 20 to 60 per cent. in the northern and central areas. Late-maturing varieties are less susceptible than early ones, and drought-resistant varieties withstand frost better than drought-susceptible ones. Cold-resistance should be regarded as a major breeding objective in the State.

Recommendations are made for the control of woodiness [cucumber mosaic virus] of passion fruit [*Passiflora edulis*] crops [ibid., 27, p. 533].

Brief descriptions are given in the second paper of the onion diseases occurring in New South Wales, of which downy mildew [*Peronospora destructor*: ibid., 22, p. 6] is the most serious. It usually occurs each spring in the coastal districts, but in inland areas it is important only in wet seasons. Others include white rot [*Sclerotium cepivorum*: ibid., 18, p. 82; 29, p. 110], neck rot [*Botrytis allii*: ibid., 29, p. 140], smudge [*Colletotrichum circinans*: ibid., 18, p. 501; 28, p. 46], black mould [*Aspergillus niger*: loc. cit.], and purple blotch [ibid., 23, p. 251]. Control measures and the effect of soil acidity on onion growth are discussed.

Sooty moulds caused by species of *Capnodium* [ibid., 18, p. 627; 24, p. 431] and related fungi are abundant on citrus leaves, always in association with scale insects and aphids. In severe cases the vigour of the tree may be impaired, the growth retarded, and blossoming reduced. The usually unevenly coloured fruit tends to ripen late. Control consists in the elimination of the insects. Prior to spraying, dead or seriously affected branches should be pruned.

Botany.—*Rep. Ga Exp. Sta., 1948–9*, pp. 36–40, [? 1950].

This report [cf. *R.A.M.*, 28, p. 380] contains the following items of phytopathological interest. In breeding work with cantaloupe melons two wild types of *Cucumis* with strong resistance to downy and powdery mildews [*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*, respectively: ibid., 27, p. 66; 29, pp. 74, 86, 245] and *Macrosporium* leaf spot [*Alternaria cucumerina*: ibid., 27, p. 66; 29, p. 75] were used to produce resistant selections.

In tests of seed dressings for groundnuts, differences in germination were frequently not significant with good seed, but when the seed was of low vitality 2 per cent. ceresan was nearly always significantly better than any other material used, followed by arasan [ibid., 29, p. 397] and then by spergon.

Three years' tests on the control of groundnut leaf spot [*Cercospora arachidicola* and *C. personata*: ibid., 27, p. 66; 28, p. 53] showed that 20 per cent. mixtures of zerlate or fermate with talc were inferior to sulphur and copper-sulphur (10–90); fermate-sulphur and zerlate-sulphur dust (both 20–80) showed some superiority to sulphur alone, but were less effective than copper-sulphur. In 1948 the increases in yield per acre of dusted Spanish groundnuts over undusted were as follows: sulphur 235 lb., fermate-sulphur 295 lb., zerlate-sulphur 300 lb., and copper-sulphur 387 lb.

When sulphur, copper-sulphur (10–90), 12 per cent. dithane Z–78 in talc, and fermate, zerlate, and parzate each 20 per cent. in talc, were used against groundnut southern blight (*Sclerotium rolfsii*) [ibid., 27, p. 66] none gave entirely satisfactory control. In general sulphur or copper-sulphur gave better results than the carbamates. Under ideal cultural conditions sulphur and copper-sulphur reduced losses to some extent, but on poorly drained, trashy sites the reductions were not significant.

An intensive study was begun of an obscure disease of groundnuts which appears as lesions upon the hypocotyl or primary branches of recently emerged seedlings and causes early death of the plant or, more commonly, a type of crown rot which may kill the central axis, one to several primary branches, or the whole plant late in the season. Several saprophytic or weakly parasitic fungi were isolated from affected material but were found unable to cause the primary lesions.

Of 34 imported species and varieties of lupin (*Lupinus angustifolius*, *L. luteus*, *L. albus*, and *L. hispanicus*) tested some appeared to be less seriously damaged by brown spot (*Ceratophorum setosum*) [ibid., 29, p. 87] than the local strain.

Department of Botany.—*Rep. Mass. agric. Exp. Sta., 1948–1949* (*Bull.* 453), pp. 19–26, 1949.

In the botanical section of this report [cf. *R.A.M.*, 28, p. 379] M. A. McKenzie, A. V. Osmun, and D. H. Marsden report that *Ceratostomella ulmi* [ibid., 29, p. 543] has been isolated from 3,478 trees in 11 of the 12 counties on the mainland of Massachusetts. Barnstable, Dukes, and Nantucket are disease-free at present.

In further work on soil treatments for damping-off W. L. Doran found that the Buisman elm (a variety of *Ulmus carpinifolia*), resistant to *C. ulmi* [loc. cit.], is best propagated by untreated root cuttings taken in March. Phygon, used as a powder-dip, improved the rooting of cuttings of *Cotoneaster horizontalis*, *Daphne cneorum*, and *Picea glauca* [var.] *conica*. Arasan or tuads gave slightly better control of damping-off of beet and tomato in limed soil than in unlimed.

L. H. Jones in further work on tobacco frenching [ibid., 28, p. 646] obtained symptoms after less than 15 days treatment, whereas the shortest period to obtain similar nitrogen deficiency symptoms was 26 days in June. Pinhead chlorosis [of the upper leaves] of nitrogen deficient leaves was preceded by extreme chlorosis and dying of lower leaves and growth retardation, which was not observed in plants with frenching. *Petunia* plants were affected by a virus which produced chlorosis and narrowed the leaves at both low and high soil temperatures.

E. F. Guba reports that hybrids of English tomatoes × Improved Bay State and × Marglobe, deriving their resistance to *Cladosporium fulvum* from *Lycopersicon pimpinellifolium*, have been selected. The resistant 44 B 292 [ibid., 28, p. 7] has been distributed and also crossed with Bay State. None of the promising wild

types resistant to blight (*Phytophthora infestans*) [ibid., 28, p. 380] survived inoculations with a local greenhouse strain from tomatoes.

Apple trees sprayed ten times (up to one month from harvest) with puratized agricultural spray (1 pint in 100 gals.) retained only five parts of mercury per 100,000,000 parts of fruit; those sprayed eight times (up to mid-July) had values identical with unsprayed fruit. Foliage chlorosis caused by phygon was prevented fairly well on Baldwin and Delicious and partly on McIntosh by the addition of Epsom salt [magnesium sulphate] 1 : 1; this caused a russeting of Delicious. Phygon chlorosis was induced on bean [*Phaseolus vulgaris*] foliage in the greenhouse and corrected by the addition of magnesium sulphate, manganese sulphate, or magnesium phosphate ($\frac{3}{4}$ lb. chemical to 1 lb. phygon). Manufacturers of phygon XL recommend the addition of $\frac{1}{2}$ lb. of magnesium sulphate to each lb. of the chemical in the spray tank.

Several carnation seedlings resistant to wilt (*Fusarium dianthi*) [ibid., 28, p. 8], which have very promising commercial value and are being propagated on a large scale, should be in the trade after two years. All chemicals tested, copper 8-quinolinate, fulex soil treatment B (with the preceding as the active base), parzate, fermate, Z–78, puratized apple spray, tag 331, malachite green, spergon, phygon XL, and thiosan, were toxic to spores of carnation fungus pathogens of stem rot [*F. culmorum* and *F.* spp.] and wilt [*Verticillium cinerescens*: loc. cit.], but only the mercury fungicides were bactericidal. Higher concentrations were needed in the presence of soil. Immersion of cuttings for 15 minutes in $\frac{1}{4}$ teaspoonful of puratized agricultural spray to 1 gal. of water plus wetter is promising.

In the section on floriculture (pp. 49–52) H. E. White states that in studies on air and soil temperatures in relation to carnation diseases (including stem and branch rot diseases caused by *Rhizoctonia*) losses from disease were highest in July, August, and September, when the highest maxima ranged from 96° to 105° F. (air) and from 65° to 72° (soil). The critical soil temperature, at which plant losses from disease were greatest, was 70°. Losses were very high in the varieties Salmon Virginia (82 per cent.), Olympia Red (75), and Mrs. C. W. Weld (73); losses of 1 per cent. or less occurred in Northland and Puritan, and Joan Marie and Virginia Rose had none. Losses from stem and branch rot under the copper tubing surface watering method, Skinner pipe system, manual hose, subirrigation by manual injection and by automatic injection, and constant water level, were 80, 34, 81, 32, 13, and 26, respectively. An outbreak of carnation smut (*Ustilago violacea*) [ibid., 18, p. 783] near Waltham, Massachusetts, in 1948 appears to be a new record for the United States. Eight varieties were infected.

Observations in 1948 on the prevalence of *Chrysanthemum* stunt disease [cf. ibid., 29, p. 27] showed that eleven of 22 varieties in a greenhouse had various degrees of dwarfing. Cyclamen stunt (*Cladosporium cyclaminis*) [ibid., 11, p. 460] was recorded for the first time in New England in October, 1948, when heavy losses occurred. The source of infection appears to be contaminated soil, but the disease may be seed borne. Two strains of snapdragon [*Antirrhinum*], P4754 and Y4196, proved resistant to rust [*Puccinia antirrhini*; ibid., 23, p. 20] under field conditions.

Miller (P. R.). **Oak tree disease proves difficult to control.**—*Agric. Chemicals*, 5, 4, pp. 63–64, 97, 1 map, 1950.

A map is given showing the area in the United States where oak wilt (*Chalara quercina*) [*R.A.M.*, 29, pp. 544, 588] has been found since it was first identified.

Roll-Hansen (F.). **Investigation of Fusarium on cultivated plants in Norway.**—*Meld. Norg. Landbr. Højsk., 1950*, pp. 257–264, 1950.

Fusarium is the most widely represented genus among the specimens submitted for examination at the Phytopathological Institute, Oslo. Species studied in pure

culture between 1940 and 1945 included *F. avenaceum*, isolated from 16 hosts, including carnation, on which it was the primary agent of a rotting at the base of cuttings and a secondary agent to *F. culmorum* in a stem rot. *F. avenaceum* f. 1, isolated from two hosts, was responsible for a brown, bitter internal rot of an Åkero apple. *F. culmorum* was isolated from the decayed lower portions of leek leaves and from five other hosts. It was at any rate partially concerned in the etiology of the leek rot, to which, however, the motile, rod-shaped bacteria in the tissues may also have contributed. *F. oxysporum* was isolated from the interior of a cucumber seedling without external symptoms, and from tomato and *Tritonia* (associated with a tuber rot). *F. oxysporum* f. [*F. conglutinans* var.] *callistephi* was the agent of aster wilt and *F. oxysporum* f. [*F. bulbigenum* var.] *niveum* was responsible for a severe wilt of greenhouse cucumbers. *F. sambucinum* was isolated from bean (*Phaseolus vulgaris*) seeds and from the base of a wilting pea plant. *F. solani* was isolated from a basal rot of *Pelargonium zonale* cuttings, and its var. *minus*, together with motile bacteria, from a decayed melon root and, in association with *Stemphylium radicinum* [*Alternaria radicina*], from carrot roots [loc. cit.]. Rotten potato tubers yielded *F. caeruleum*.

De Ropp (R. S.). **The comparative growth promoting action of indole-3-acetic acid and Agrobacterium tumefaciens.**—*Amer. J. Bot.*, 37, 5, pp. 352–363, 15 figs., 2 graphs, 1950.

This is an expanded account of experiments carried out at the New York Botanical Garden [cf. *R.A.M.*, 29, p. 355]. On carrot roots treated with suspensions of crown gall bacteria (*Agrobacterium* [*Bacterium*] *tumefaciens*) tumours appeared six days after inoculation as green or purple spherical masses distributed mainly along the line of the cambium. On Jerusalem artichoke (*Helianthus annuus*) tubers white tumours appeared four to six weeks after inoculation. Crown gall tumour tissue converted 10 to 20 per cent. of the fresh weight of the storage organ into itself. Reactions of carrot tissue to the organism varied from strong (massive tumour production) to negative. When carrot fragments were treated *in vitro* with the bacteria or indole-3-acetic acid paste, the cambial tissue proliferated more than the phloem or xylem. Fragments cultured on sucrose agar without the acid developed spontaneous tumours on the radical side of the fragment generated by the cambium. The growth rate of crown gall tumour tissue of carrot grown in isolation on a medium containing aureomycin was about five times as rapid as that of spontaneous tumour tissue on sucrose mineral agar and approximately double the same when indole-3-acetic acid was added. Since the growth of carrot crown gall tissue was significantly influenced by the presence of this acid in the medium, it was concluded that whereas indole acetic acid belongs to a large class of substances capable of causing cellular proliferation, it is not mutagenic. The crown gall organism, however, brings about a permanent change in the growth pattern of the tissues and causes the formation of a tumour meristem totally lacking in polarity and generating a spherical mass of xylem and phloem, the former being devoid of vessels and the latter of sieve tubes. It was concluded that the phenomenon described by Gautheret as 'accoutumance' is more probably the result of a somatic mutation than of the direct action of indole acetic acid.

Posnette (A. F.), Robertson (N. F.), & Todd (J. McA.). **Virus diseases of Cacao in West Africa. V. Alternative host plants.**—*Ann. appl. Biol.*, 37, 2, pp. 229–240, 2 pl., 1950.

In a further contribution in this series [cf. *R.A.M.*, 29, p. 253] the authors give a full account of their experiments carried out at the West African Cacao Research Institute, Tafo, Gold Coast, to determine the alternative indigenous host plants of cacao swollen shoot viruses [ibid., 29, pp. 205, 253, 409], some results of which have

already been noticed. Cacao beans were used as indicators [ibid., 27, p. 515] to detect viruses in the hosts subjected to infective mealy bugs (*Pseudococcus njalensis*) [ibid., 29, p. 294]. Members of all genera of the Bombacaceae represented in West Africa can become systemically infected with virus 1A. *Adansonia digitata* was the most easily infected and reacted with severe stunt and conspicuous leaf symptoms; it also gave a high percentage of transmissions to cacao. It is an unimportant host as it is rarely found in association with the latter. *Bombax buonopozense*, also unimportant as a field host, and *Ceiba pentandra* were more resistant and gave low transmission percentages. Of the Sterculiaceae, the only other family of the eleven tested which includes susceptible species, *Cola cordifolia* developed severe veinbanding on the first and second leaves formed after inoculation with 1A. *Sterculia rhinopetala* and *S. tragacantha* were immune from 1A but the former was susceptible to 1C. This confirms previous findings that virus 1C is probably a distinct virus [ibid., 27, p. 179]. Both *Sterculia* spp. were susceptible to virus 1M, a strain not previously recorded. It was found at Mampong in the Akwapim hills, and differs from 1A in the pattern and intensity of the mosaic and in causing the production of flushes with symptoms followed by several symptomless flushes. *C. cordifolia* and the Bombacaceae were highly resistant to viruses 1C and 1M.

The cacao viruses from an outbreak of swollen shoot at Offa Igbo, Nigeria, are regarded as distinct from the Gold Coast viruses, as they failed to protect plants against the latter. *Ceiba pentandra*, *B. buonopozense*, and *Cola cordifolia* were susceptible to one of the Nigerian strains, thus showing its similarity to virus 1A, though the symptom expressions differed.

Field tests in the Western Province of the Gold Coast demonstrated that *C. chlamydantha* trees were naturally infected with viruses apparently identical with those causing swollen shoot of cacao in that area. Transmissions were obtained with the mealy bugs *Paraputo ritchiei* and *Pseudococcus masakensis* from mature plants, seedlings, and coppiced plants. In the first survey, of 32 *C. chlamydantha* plants growing in cacao farms with swollen shoot outbreaks, in secondary 'bush', and in a forest reserve about ½ mile from the nearest cacao, 16 were found infected. Of 80 forest trees tested in the second survey, some growing as far as 3 miles from the nearest infected cacao, transmissions were obtained from 32. *C. chlamydantha* growing in the vicinity of cacao should be destroyed.

C. chlamydantha does not occur in the Eastern Province where virus 1 A is widespread, but *Cola cordifolia* and *Ceiba pentandra* trees are commonly used as shade trees in cacao farms. In field tests on the Institute's land which are still in progress, transmission has been obtained from only two *C. pentandra* trees out of 57 but in spite of the low transmission rate many trees may be infected, though symptomless. Both species are potentially dangerous to cacao. Unfortunately the trees are difficult to eradicate because of their size, and suitable poisons are being investigated. In the meantime seedlings and saplings should be destroyed.

The results of field tests in Nigeria were inconclusive, transmissions being obtained only from *C. pentandra*. The latter, together with *B. buonopozense*, *A. digitata*, and *Cola cordifolia* which occur commonly as coppiced stumps, should be eradicated as possible virus sources.

In their reaction to cacao viruses the indigenous host plants differ from cacao in symptom expression and ease of virus transmission. Leaf symptoms usually occur only when plants are newly infected. Transmission by vectors to cacao is mostly difficult and often impossible in the chronic (symptomless) phase. The virus concentration in these plants is probably much lower than in cacao.

Bruehl (G. W.) & Dickson (J. G.). **Anthracnose of cereals and grasses.**—*Tech. Bull. U.S. Dep. Agric.* 1,005, 37 pp., 9 figs., 12 graphs, 1950.

Investigations carried out at the Wisconsin Agricultural Experiment Station in

co-operation with the Division of Cereal Crops and Diseases, United States Department of Agriculture, on anthracnose of cereals and grasses (*Colletotrichum graminicola*) [*R.A.M.*, 27, p. 526; 29, p. 535] showed that the fungus is a high-temperature organism with optimum mycelial development at 28° C. Partial adaptation of fungus to host was expressed in the greater heat requirements of isolates from species of sorghum [ibid., 29, p. 299]. Temperature had little effect upon the final severity of seedling disease of Sudan grass [ibid., 26, p. 494], but relatively low temperatures reduced seedling disease in rye. Soil microflora had an antagonistic effect upon the pathogen as reflected in disease development. Soil type appeared to influence the severity of anthracnose development on the roots and lower internodes of rye indirectly, through the action of microflora. The disease reduced the yields of rye and Sudan grass, mainly by destroying the seminal root system and damaging the seedling axis below the coronal nodes. Both hosts suffered severely when the fundamental parenchyma of the region of the scutellar node or the main meristem was parasitized. The fungus penetrated young tissues of the host directly, though the endodermis and pericycle served as partial barriers. Before sporulating, mycelial masses, rich in stored food, developed in the epidermal cells. A gum was deposited in the xylem vessels of affected plants. Host specificity was observed among different isolates. Crop rotations in which closely related species do not follow one another are a sufficient precaution against building up inoculum, unless environmental conditions, including soil fertility, are very unfavourable to the host. Isolates from the several hosts showed a wide range in pathogenicity under identical conditions.

Delevitch (B. S.). Резултати испитивања класичних и нових средстава за потапање и запрашивање семена Пшенице противу **Tilletia sp.** [The results of investigations of old and new Wheat seed treatments against *Tilletia* sp.]—*Annu. Fac. agron. Belgrade*, 2, pp. 361–381, 2 pl., 1 graph, 1949. [Russian and French summaries.]

As a result of experiments conducted by the Faculty of Agriculture, Belgrade, in 1947 and 1948 with various fungicides for the control of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 27, p. 468; 29, p. 92] it is concluded that the disease can be controlled most effectively by treating the grain for 30 minutes with 1 per cent. copper sulphate, which reduces germination only negligibly; 0·5 per cent. copper sulphate is also satisfactory. Soaking the seed in 1 in 300 formalin for 10, 20, and 30 minutes reduced germinability by 2 to 5 per cent. The material is, however, most effective for the control of bunt and a 30 minute soak is recommended, or a 10 minute one with subsequent exposure for two hours to formaldehyde vapour immediately prior to sowing. Excellent results were obtained with the dusts germisan and ceresan (0·2 gm. for 100 gm. seed).

Manners (J. G.). **Studies on the physiologic specialization of yellow rust (Puccinia glumarum (Schm.) Erikss. & Henn.) in Great Britain.**—*Ann. appl. Biol.*, 37, 2, pp. 187–214, 2 pl., 1 diag., 1 graph, 4 maps, 1950.

In studies carried out from 1945 to 1948 at the Botany School, Cambridge, 223 British collections of yellow rust (*Puccinia glumarum*) [*R.A.M.*, 28, p. 517] were determined on Gassner and Straib's differential hosts [ibid., 12, p. 272; 28, p. 322], with the addition of the wheat variety Wilma. Physiologic races 2, 3, 5, 6, 7, 8, and 17 were isolated from wheat, race 46 from barley, race 33 from *Hordeum murinum*, and race 28 from *Agropyron repens*. Three new races were obtained, namely, 6*x* from wheat, *M* from *H. marinum*, and *G* from *Dactylis glomerata*. Race *G* was the only one which would infect *D. glomerata*.

Blé rouge d'Écosse and particularly Webster showed increased resistance to some races at high temperature, while Holzapfels Früh became more susceptible

to all races which it resists at low temperatures. Vilmorin 23 became slightly susceptible to races 5, 7, 8, and 17 at 18° C., though it is highly resistant to them at lower temperatures. Carstens Dickkopf V and Spalding's Prolific were also more susceptible to many races at 18° than at lower temperatures. Isolations were made of biotypes of races 2, 6, and 8, which differ from the 'type' cultures of those races.

Of the more common wheat races Nos. 6 and 8, occurring on many varieties, were widespread, while 5 and 7, on fewer varieties, were confined to the north of Great Britain, and 2 and 3, on very few varieties (in particular Bersée and Desprez 80), to the south. Certain grasses are partially susceptible to some of the cereal races, but no cereal race has been isolated from any grass in Britain. *Agropyron caninum* was resistant to all races tested, and *Bromus erectus* and *B. mollis* appeared immune. The uredospores of races 2 and 3 germinated more slowly than the other wheat races, race 8 germinating especially rapidly. The optimum temperature for spore germination of all races was 10° to 13°, except for race *G*, which was 22·5°.

Of 12 wheat varieties inoculated in the field with each of the eight wheat races, Rampton Rivet and Wilma exhibited field resistance (considered to be true mature plant resistance) to race 2 (and probably race 3), Jubilegem to 2 and 6 (and probably other races), and Yeoman and Holdfast to certain races. The field resistance of Joss 4, Squarehead's Master, and, to a lesser extent, Wilhelmina, to all races tested, may have been due to high temperatures, the maturity of the plants, or both. The races attacking a variety most severely in the field trials were mostly the races isolated from that variety in collections received.

Clydesdale (C. S.). **Wheat growing in Queensland.**—*Qd agric. J.*, 70, 6, pp. 311–337, 18 figs., 1 diag., 1950.

This account of the various aspects of wheat growing in Queensland includes notes on the principal varieties grown. A cross-bred selection, which it is hoped to liberate under the name of Lawrence, was derived from a cross between Florence and a highly rust-resistant variety known as College, but which is almost certainly the North American variety Hope. Thorough testing has shown that to date this variety is the most resistant to stem and leaf rust [*Puccinia graminis* and *P. triticina*: *R.A.M.*, 27, p. 69] in Queensland under field conditions. Puora, the present standard Queensland variety, derived from a Pusa–4 × Flora cross made in 1926 is fairly susceptible to both stem and leaf rust but escapes serious injury in most seasons. Derived from a cross between Pusa–4 and Three Seas, Puseas has been one of the five leading varieties in the State since 1942. It is moderately susceptible to leaf rust but possesses good field resistance to stem rust. Seafoam and Three Seas are both selections from Comeback × Cretan × Comeback, and while not highly resistant to rusts they show a useful tolerance to them in the field. Warput, bred from the cross Pusa–4 × Warren, also shows quite good field resistance, being superior to most of the older Queensland varieties in this respect. Seed supplies are available through the Queensland State Wheat Board, Margaret Street, Toowoomba.

Thomas (I.) & Watson (E. R.). **Wheat variety trials on research stations.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 27, 1, pp. 121–127, 1950.

Wheat flag smut [*Urocystis tritici*: *R.A.M.*, 29, p. 15] is no longer of great importance in Western Australia owing to the effective control given by resistant varieties. Isolations from Eureka wheat at Toompup indicate that race 126 B of stem rust [*Puccinia graminis*: ibid., 29, pp. 150, 294] is present in Western Australia; if this is confirmed Eureka and its derivative Wongoondy will no longer

be regarded as resistant locally. In notes on new varieties it is stated that Yalta, because of its resistance to race 126 B and its satisfactory agronomic characters, is recommended as a rust-resistant, mid-season variety; it is considered to be superior to Eureka. Dowerin is resistant to all known Australian races of *P. graminis*. The cross-bred varieties M. 89 and M. 91 and others having the Eureka type of resistance will probably be eliminated from future yield trials in view of the suspected presence of race 126 B.

HYDE ([Miss] M. B.). **The subepidermal fungi of cereal grains. I. A survey of the world distribution of fungal mycelium in Wheat.**—*Ann. appl. Biol.*, 37, 2, pp. 179–186, 1 diag., 1 graph, 1950.

Examination at the Pest Infestation Laboratory, Slough, of 278 samples of wheat grain received from 89 localities in different parts of the world in 1947 and 1948, showed that a subepidermal mycelium [*R.A.M.*, 24, p. 143] occurred in all of them, except five varieties from five dry districts. The amount of mycelium as measured by the proportion of the epidermis infested varied considerably, but tended to be more or less constant for each locality. Variety had some effect on amount of fungus, but environmental conditions were more important. The fungal scores for Mentana wheat from several localities tended to be among the highest, while those for Fylgia were mostly about or slightly below the average for each of the several regions. The mean score for durum wheats was about half that of other wheats, probably because they are commonly grown in the drier countries, where all varieties and types had low scores. For all varieties examined there was a statistically significant, inverse correlation between the fungal score of each sample and the time required to strip the epidermis. When the epidermis is loose the hyphae can spread more rapidly in the greater space beneath. There was a tendency towards higher fungal scores in localities with higher relative humidity. A somewhat limited number of examples demonstrated a clear correlation between the amount of internal fungus and atmospheric humidity in the few weeks before harvest, and also a statistically significant inverse correlation between amount of internal fungus and mean temperature a fortnight before harvest. No correlation was found between fungal score and moisture content of the grains as determined on arrival, which was on the whole fairly low.

ZACHA [V.]. **Zajímavá choroba na Pšenici.** [An interesting Wheat disease.]—*Ochr. Rost.*, 22, 5–6, p. 257, 1949.

In 1949 the ears of winter wheats in several fields in Czechoslovakia were affected by *Macrophoma hennebergii* [*Septoria nodorum*: *R.A.M.*, 7, p. 626; 28, p. 619]. The fungus often occurred in association with species of *Fusarium* and *Erysiphe graminis* [ibid., 11, p. 157], causing some damage. The spores of *S. nodorum* were considerably larger than those originally described, measuring 20 to 27 by 2 to 3 μ. [In an editorial note it is stated that the fungus was widespread in wheat fields in the vicinity of Prague, the spore measurements agreeing with Zacha's. The unsettled weather conditions with great differences in temperatures were probably especially favourable to the development of the pathogen.]

PEYRONEL (B.). **La Sclerospora macrospora Sacc. sulla Segala.** [*Sclerospora macrospora* Sacc. on Rye.]—*Nuovo G. bot. ital.*, N.S., 55, 2, pp. 331-332, 1948. [Received July, 1950.]

In June, 1946, the author received from two moist, low-lying fields near Lombriasco specimens of rye and wheat showing symptoms of *Sclerospora macrospora* [*R.A.M.*, 12, p. 537; cf. 29, p. 462]. The disease caused prolonged vegetative activity in the rye plants and marked deformation of the wheat spikes.

Gassner (G.). **Neuere Versuche zur Bekämpfung des Gerstenflugbrandes.** [Recent experiments in the control of Barley loose smut.] —*NachrBl. dtsch. PflSchDienst (Braunschw.)*, 2, 5, pp. 65–67, 1 graph, 1950.

Experiments in the control of barley loose smut [*Ustilago nuda*] by moistening the seed with hot water [*R.A.M.*, 17, p. 667] have recently been resumed with the following results. Absolute control of the disease, without appreciable impairment of germination or vigour, is obtainable by four hours' treatment at 46° C., using 15 l. water per 100 kg. seed, or three hours at a dosage of 20 l. The formula recommended on this basis is three hours' treatment at 46° with 17 to 18 l. water per 100 kg. seed. The treated seed should be spread out and left for a day or two before drying.

Wood (J. G.) & Sibly (Pamela M.). **The distribution of zinc in Oat plants.**—*Aust. J. sci. Res.*, Ser. B, 3, 1, pp. 14–27, 22 graphs, 1950.

After stating that throughout large areas of South Australia cereals and pasture plants are unable to absorb from the soil enough zinc and copper for normal growth and development [*R.A.M.*, 28, p. 629; 29, p. 18, and below, p. 623], the authors give a full account of laboratory experiments carried out at the Botany School, University of Adelaide, which demonstrated that zinc is absorbed continuously during the life-cycle of oat plants, redistribution occurring during inflorescence and grain development. No zinc is translocated from the leaves to the other organs, but it is supplied to the inflorescence and the grain from the root.

Kehr (W. R.) & Hayes (H. K.). **Studies of inheritance in crosses between Landhafer, Avena byzantina L., and two selections of A. sativa L.**—*Agron. J.*, 42, 2, pp. 71–78, 3 figs., 1950.

At the Minnesota Agricultural Experiment Station in 1948–9 studies of inheritance were made in crosses between Landhafer (*Avena byzantina*) and two cultivated oats selections [*R.A.M.*, 19, p. 206] from Mindo × Joanette and Bond–Rainbow × Hajira–Joanette, respectively, with particular attention to reaction to the following races of crown rust [*Puccinia coronata*]: 6, 33, and 45 from Minnesota; 1, 3, 4, and 5 from Winnipeg, Canada; 57 and 58 from Iowa. Data were also obtained on reaction to race 6 of stem rust [*P. graminis*] and on other characters which differentiate the parent [see next abstract].

The F_1 generation of both crosses was resistant in the seedling stage to race 45 of crown rust, though slightly less so than *A. byzantina*. A single factor pair from the latter parent was found to condition resistance to all nine races of *P. coronata* tested. The *A. byzantina* factor was shown to be non-allelic to the factor pairs in Bond. At 70° to 80° [F.] the F_1 progeny of both crosses was susceptible in the seedling stage to *P. graminis* race 6. *A. byzantina* was highly susceptible and the other parents highly resistant. The recovery of lines breeding true for resistance in the F_3 and F_4 was more frequent than would be expected on a single-factor pair basis (13 resistant or segregating to three susceptible).

Crown and stem rust reactions appear to be inherited independently of each other and also of the botanical characters differentiating the parents, and the combination of resistance to both pathogens should present no great difficulty.

Kehr (W. R.), Hayes (H. K.), Moore (M. B.), & Stakman (E. C.). **The present status of breeding rust resistant Oats at the Minnesota Station.**—*Agron. J.*, 42, 7, pp. 356–359, 1950.

This is a summary of the genetic and breeding studies, accomplished and in progress, on the development of resistance in oats to stem and crown rusts

(*Puccinia graminis* and *P. coronata*) [*R.A.M.*, 29, p. 255], with special reference to the contributions to this project of the Minnesota Agricultural Experiment Station [see preceding abstract].

ZACHA [V.]. **Helminthosporium na Kukuřici.** [*Helminthosporium* on Maize.]—*Ochr. Rost.*, 22, 5–6, pp. 258–259, 1 fig., 1949.

Helminthosporium turcicum [*R.A.M.*, 29, p. 83] was reported on maize from several localities in the Brno district in 1949. This is the first record of the fungus in Czechoslovakia.

HERNÁNDEZ-MEDINA (E.) & SHIVE (J. W.). **Calcium-boron relationship in the nutrition of Corn and the distribution of these elements in the plant.**—*J. Agric. P. R.*, 30, 4, pp. 251–291, 5 figs., 2 diags., 6 graphs, 1946. [Received June, 1950.]

In studies carried out at Rutgers University, New Brunswick, New Jersey, maize plants grown in sand cultures deficient in boron [*R.A.M.*, 14, p. 233; 18, p. 307; 22, p. 38] developed elongated, white, transparent stripes in the new leaves. The symptoms increased in severity with increasing calcium content of the substratum throughout the range of the four highest nutrient levels of calcium used (50, 100, 250, and 500 p.p.m.), except that they were rather more severe at 250 than at 500 p.p.m. The growth of maize plants suffering from boron toxicity was stunted, the top leaves were yellow or yellow green, and the tips of the lower leaves brown and dead. Boron toxicity decreased in severity with increasing calcium content of the substratum which determined the calcium content of the tissues irrespective of the nutrient level of boron.

HIRSCHHORN (ELISA) & MUNNECKE (D. E.). **The effect of sodium arsenite on the combining ability of monosporidial lines of Ustilago zeae.**—*Phytopathology*, 40, 5, pp. 524–526, 1950.

Studies were carried out at the Minnesota Agricultural Experiment Station to ascertain whether the enhanced tolerance of monosporidial lines of *Ustilago zeae* [*U. maydis*] of increasing concentrations of sodium arsenite when grown for several consecutive transfer-generations on arsenic-containing media (abs. in *Phytopathology*, 36, p. 411, 1946) might be due to mutation.

The haploid, monosporidial lines used in the experiments, 10A4 and 17D4 [*R.A.M.*, 28, p. 233], are of opposite sex and produce normal galls and chlamydospores when inoculated jointly into maize plants [ibid., 23, p. 60]. Both lines adapted themselves readily to arsenic, but after adaptation the lines failed to cause infection in maize when combined in the usual way, whereas the unadapted controls were normally pathogenic. Crosses between 10A4 and 17D4, both grown on plain potato dextrose agar, and between 10A4 (on the same medium plus sodium arsenite) and 17D4 (plain potato dextrose agar) produced satisfactory infection, but negative results were obtained with 10A4 × 17D4 (both on potato dextrose agar plus sodium arsenite) and 10A4 (plain potato dextrose agar) and 17D4 (the same plus sodium arsenite). It thus appeared that the sodium arsenite had at any rate temporarily arrested the ability of 17D4 to combine with 10A4 and produce galls and chlamydospores in maize, but that no comparable effect was exerted on 10A4.

In further tests both lines were extremely virulent at dosages of sodium arsenite up to 7,000 p.p.m., but at and above 8,000 p.p.m. the growth rates were much slower and 17D4 failed to combine with 10A4 and cause infection, whereas the latter retained its efficiency. The culture of 17D4 largely regained its lost pathogenicity after three transfer generations on plain potato dextrose agar, suggesting

that the reversal under the influence of sodium arsenite was a 'Dauermodifikation' rather than a mutation.

McClean (A. P. D.). **Some forms of streak virus occurring in Maize, Sugar-Cane, and wild Grasses.**—*Sci. Bull. Dep. Agric. S. Afr.* 265, 39 pp., 21 figs., 1947. [Received March, 1950.]

This is a full account of studies carried out from 1931 to 1940 at the Botanical Station, Durban, on some of the forms of streak virus responsible for streak diseases in maize, Uba sugar-cane, *Digitaria horizontalis*, and *Eleusine indica* [*R.A.M.*, 5, p. 1; 15, pp. 528, 645, 744; 29, p. 289, *et passim*]. The virus usually associated with naturally infected maize, or the A form, another form of maize streak virus now reported for the first time, or B form, and the virus causing streak disease of Uba sugar-cane (Uba streak virus or U-streak) were all transmissible by *Cicadulina mbila* to *E. indica*. The inconsistency of the results, however, indicated that successful transmission was controlled by some particular factor apparently associated with the host. There may be races of *E. indica* immune from streak viruses. The Uba virus afforded no protection to maize against either the A or B virus, though a rather high degree of protection against A resulted in plants previously infected with B.

The A and B forms from maize produce a permanent disease of a severe and mild kind, respectively, in maize, *D. horizontalis*, and *E. indica*. They are transmitted with difficulty to Uba cane, in which they produce a transitory infection shown by occasional streaks on one or two leaves. Under favourable conditions the incubation period in maize is three days.

A streak virus isolated from *Sporobolus pyramidalis* (*Sporobolus* virus) produces a permanent disease of severe type in maize. It is slightly less severe than the disease caused by the A virus and is not transmissible to Uba cane. The incubation period [in maize] is three days.

The Uba virus from Uba cane produces a permanent disease of mild type in Uba cane, maize, and *E. indica*. It is not transmissible to *D. horizontalis*. Under favourable conditions the incubation period in Uba cane is usually 10 to 14 days and in young maize 6 to 11 days.

At least two viruses were associated with naturally infected *E. indica*. One is probably identical with the A form, while the other, referred to tentatively as *Eleusine* virus, produces a permanent disease of mild type in maize, is not transmitted to Uba cane, and has an incubation period in maize of 6 to 8 days.

A streak virus isolated from *Paspalum notatum* (*Paspalum* virus) produces a permanent disease of mild type in maize and *E. indica*. It is not transmissible to *D. horizontalis* or Uba cane. The incubation period in maize is 6 to 8 days. It may be identical with the *Eleusine* virus.

One plant of Uba cane was found naturally infected with both the Uba and the A virus.

The chlorotic markings produced in maize by the B form are narrower than those caused by the A virus. Virtually no lateral fusion occurs between the affected areas in adjacent stripes, and at all stages a zone of normal green tissue lies between each pair of streaks. The chlorotic tracts are most extensively developed along the path of the secondary and tertiary veins, where the streaks are a few mm. to several cm. long. Interruptions in the continuity of the chlorotic tracts by green tissue occur at more frequent intervals than on leaves affected by the A virus. The streaks tend to become less frequent on the last leaves and they may be less well defined, owing to the presence of some pigment in the affected areas. The streaks produced by the B form on *D. horizontalis* and *E. indica* are narrower than those caused by the A form. The stripes are separated by a zone of normal green tissue and the streaks are pale yellow.

These results confirm the view that there are several streak viruses. The different forms are distinguishable either by their host range or by the type of chlorotic pattern produced on the leaves of certain hosts, while their rate of development within the host also provides a means of differentiating between some of them. Most are transmissible to more than one species. The two of greatest economic importance in South Africa are the Uba virus and the A form. The forms of streak virus found in naturally infected grasses do not appear to be of economic importance.

It is concluded that the streak viruses constitute a natural group by reason of their mode of transmission (by *C. mbila*) and the close similarity of the symptoms produced. Some show closer affinities than others. The two forms of maize virus appear to be more closely related to each other than they are to the Uba virus, which probably bears a closer relation to some of the forms occurring in wild grasses.

CICCARONE (A.). **Alcune osservazioni su Cercospora sorghi E. et E.** [Some observations on *Cercospora sorghi* E. & E.]—*Ann. Sper. agr.*, N.S., 4, 2, pp. 281–289, 1 pl., 2 figs., 1950. [English summary.]

In December, 1947, sorghum growing in experimental fields of the Department of Genetics, Maracay, Venezuela, which had already been severely attacked by *Cercospora sorghi* [*R.A.M.*, 18, p. 517; 24, p. 388; 29, p. 504], showed narrow, elongated lesions on the leaves, bordered by two veins or covering one only, and red, almost orange on some varieties, to dark red, bluish, or almost black on others. As a rule, particularly in low-lying situations and in a group of plants near an irrigation canal, the lesions showed scalariform markings. The lesions faded when rain fell in June and only the usual oval, dark, and reddish discolorations caused by *C. sorghi* were visible.

On the affected material a *Cercospora* near to *C. sorghi* was detected, the only difference being that at the apex of the conidiophores of the former there was frequently a double scar and the conidia were more conspicuously catenulate with a more irregular profile. Conidia from two lots of leaves with the new type of lesion had 2 to 7 (average 4·36) and 1 to 11 (average 4·92) septa, respectively, and measured 28 to 118·25 (average 56·2) by 2·75 to 4 (average 3·1) μ and 27·5 to 129·25 (average 57·2) by 2·5 to 4 (average 3·1) μ, respectively; those from two lots of leaves with the ordinary type of lesion had 4 to 11 (average (7·1) and 5 to 11 (average 8·2) septa, respectively, and measured 52·25 to 90·75 (average 72·2) by 3·5 to 7 (average 5·1) μ and 60·5 to 110 (average 84·4) by 4·5 to 6 (average 5·2) μ. In culture the *Cercospora* from the zonate spots grew much more slowly than *C. sorghi* and was of a more olive green colour.

The author concludes that the fungus is an adaptation form of *C. sorghi* induced by the local environmental conditions.

CICCARONE (A.). **Un 'marciume basale' dei frutti di Mandarino e di Arancio.** [A 'basal rot' of Mandarin and Orange fruits.]—*Nuovo G. bot. ital.*, N.S., 56, 1–2, pp. 291–293, 1 fig., 1949.

In the autumn of 1948 the author received from an orchard at Fondi, Italy, much affected by fruit drop [cf. *R.A.M.*, 27, p. 233], orange and mandarin fruits with a dark lesion round the stalk. In the affected area, which sometimes covered one third of the surface of the basal half of the fruit, the skin was dry and depressed. Microscopic examination showed that in the early stages there was a reduction of the water content of the pith and sometimes necrosis of the oil glands. The fruits were not at first discoloured, but under and round the calyx they showed traces of attack by insects and small animals. Later various fungi were found, especially *Penicillium* spp. and *Fusarium* spp., but infection by these seemed to be unrelated

to infection of the stalks by *Colletotrichum gloeosporioides* [loc. cit.], which was occasionally present.

The affected orchard was in a sheltered position, trunk rot due to *Phytophthora* [? *citrophthora*: cf. ibid., 17, pp. 727, 728] was rife, [unspecified] sooty mould [cf. ibid., 3, p. 211; 12, p. 284] was abundant, and the trees showed marked physiological wilt. The grower stated that the affected fruits were those which had been exposed to sudden drops in nocturnal temperature in the early stages of growth; workers said that the condition occurred every year mainly on fruits unprotected by foliage. The author concludes that the basal rot was primarily due to unfavourable environmental conditions which favoured insect and animal attack; fungi entered through the punctures so caused.

Littauer (F.) & Gutter (J.). **Mass spore production of Diplodia natalensis and some other fungi pathogenic to Citrus fruits.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 174–176, 1949. [Hebrew summary. Received August, 1950.]

For mass spore production by *Diplodia natalensis* [*R.A.M.*, 23, p. 386; 28, p. 63], sterilized oat seeds were found to be best in tests of five types of cereal grains at the Division of Plant Pathology, Agricultural Research Station, Rehovot. Abundant spores developed which were viable and virulent for at least 12 months. Darkness delayed the formation of pycnidia on these seeds by three to four days. Twelve other fungi pathogenic to citrus were tested on oats, good growth and pycnidial formation being obtained with *Sphaeropsis* sp. and *Phomopsis* sp. only.

Littauer (F.) & Nadel-Schiffmann (Mina). **Control of brown rot in Citrus fruits with nitrogen trichloride.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 181–182, 1949. [Hebrew summary. Received August, 1950.]

Further experiments during 1948 to 1949 were carried out at Rehovot, Israel, to determine the effect of nitrogen trichloride treatment on citrus fruit naturally and artificially infected with *Phytophthora citrophthora* [*R.A.M.*, 28, p. 64]. Shamouti oranges were inoculated by dipping in a watery suspension of the fungus and maintained under moist conditions at 8° to 12° C. for 16, 24, and 48 hours before wrapping and subsequent treatment. The incidence of brown rot was 1, 0, and 33 per cent. compared with 13, 30, and 38 for untreated fruit. Thus nitrogen trichloride is effective in controlling brown rot only if applied within 24 hours of inoculation. The gas failed to control the disease in naturally infected fruit since it was applied at least 48 hours after picking, by which time the disease was too well established for it to have any effect.

Minz (G.) & Gutter (J.). **Sclerotium bataticola as a potential pathogen of various Citrus fruits.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 182–184, 3 figs., 1949. [Hebrew summary. Received August, 1950.]

The authors isolated *Sclerotium bataticola* [*Macrophomina phaseoli*: *R.A.M.*, 26, p. 485] from a rot, resembling that caused by *Diplodia natalensis*, of grapefruits in a grove near Rehovot. In culture the sclerotia measured 50 to 150 (average 90) μ in diameter. These were successfully inoculated to Marsh grapefruit, Shamouti and Valencia oranges, Eureka lemon, and sweet lime, either through the rind or the stem end, the rot appearing after incubation periods varying from 5 to 14 days. The symptoms appeared usually as a light brown watery spot at the point of inoculation, or sometimes at the stylar end, which spread over the whole fruit, either in irregular patches or along the segments. The transition in colour in decaying grapefruits was pinkish to grey and black. In all other fruits the rotten patches turned brown; they finally became black with sclerotia after 10 to 28 days. With sweet limes the rotting and subsequent darkening were more rapid than in the other fruits and lasted 7 to 13 days only.

Minz (G.). **A starch test to aid in the pruning of Citrus trees affected by Diplodia.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 184–185, 1949. [Hebrew summary. Received August, 1950.]

During 1945 attempts were made at Rehovot, Israel, to distinguish with certainty between healthy parts of citrus trees and those affected by *Diplodia natalensis*, as a guide to pruning for control of the disease. The application of iodine in potassium iodide to the cut surface of branches of Shamouti orange trees established that those killed off and dried by the fungus are devoid of starch. Adjacent to the dead part the starch appears gradually, the healthy parts being filled with starch and staining deeply over the whole cut surface. Cultures made from the parts from which starch had partially disappeared mostly yielded *Diplodia*. Apparently healthy tissue occasionally harboured the fungus but never further than 15 to 20 cm. beyond the point where the test began to be positive.

Py (C.). **Le 'quick decline' en Californie.** [Quick decline in California.] –*Fruits d'Outre-Mer*, 5, 3, pp. 82–88, 7 figs., 3 diags., 1 map, 1950.

Following a visit to the experimental citrus orchards and nurseries at Covina and Baldwin Park, and conversations with Dr. W. P. Bitters and Dr. J. M. Wallace, the author outlines the history of quick decline in California [*R.A.M.*, 29, pp. 362, 500] and the extent of the damage during the past five years. He describes the development of the disease, the symptoms in an orange scion grafted on to Seville orange stock, duration of the various stages, propagation, and hosts. The reaction of various combinations of stocks and scions to the disease, and experiments aimed at modifying or avoiding a combination susceptible to quick decline are discussed. The author concludes by briefly outlining research being carried out on new stocks at the University of California [see next abstract], and in Texas and Brazil.

Wallace (J. M.) & Bitters (W. P.). **The quick decline disease.**—*Calif. Citrogr.*, 35, 8, pp. 322, 350–351, 1950.

In controlling quick decline of citrus [see preceding abstract] in California it has been found that trees if not too seriously affected can be top-worked satisfactorily with lemon [cf. ibid., 29, p. 300]. It is essential to eliminate the entire sweet orange top in this operation and all leaf growth developing from the orange should be instantly removed. Until further information is available on the results of rootstock trials it is concluded that orange trees grown on sweet orange, rough lemon, or trifoliate orange roots are resistant to quick decline. Lemons apparently are resistant regardless of the rootstock. Grapefruit on sweet orange roots inoculated in 1945 have grown normally.

Child (R.). **Recent research on the Coconut Palm with special reference to Ceylon.** —*Emp. J. exp. Agric.*, 18, 71, pp. 177–189, 1950.

This is a review of literature (62 titles) on recent advances in the knowledge of coco-nut palms, with special reference to the investigations carried out in Ceylon. In the section on pests and diseases (pp. 177–180) bud rot (*Phytophthora palmivora*) [*R.A.M.*, 27, p. 556], the physiological disorder tapering stem wilt or 'pencil point' [ibid., 20, p. 112; 29, p. 559], and premature nut-fall [ibid., 20, p. 572] are briefly discussed. *P. palmivora* is one of the suspected agents of the last-named disease, causing shedding of full-sized, but immature nuts.

Fraselle (J.). **Observations préliminaires sur une trachéomycose de Coffea robusta.** [Preliminary observations on a tracheomycosis of *Coffea robusta*.]—*Bull. agric. Congo belge*, 41, 2, pp. 361–372, 1950. [Flemish summary.]

Preliminary studies are described on a wilt of *Coffea robusta* observed at Yangambi, Belgian Congo, in September, 1949. The disease is dangerous by reason

of its epidemic character, 30 to 40 per cent. of the trees in some blocks being already dead or diseased. The first symptom is a generalized chlorosis of the leaves, which may become flaccid and conspicuously curled; they turn brown, dry up, become very fragile, and drop. The crowns of dead trees are completely defoliated. The branches may turn blackish or brown-black, or merely dry up, these symptoms spreading from the base to the extremity (the result of the spread of the parasite within) or from the extremity to the base (effect of desiccation). On the trunk the bark is hypertrophied and has numerous vertical or spiral cracks, which reveal a blackening of the tissues within. In the roots this black rot tends to become moist. The diseased areas begin at the roots or collar and spread up to the crown. Infection may be general or partial. The trunk is nearly always attacked before the crown, though in a few cases the crown is affected first.

In the diseased wood the main tracheids are heavily infected by a mycelium. At the limit of spread the tracheids alone are affected, but where infection has been long established the mycelium is found in the fibres surrounding the vessels and in the medullary rays. The wood parenchyma is rarely attacked. The primary xylem and the pith of the branches may also be invaded. Distinct tyloses develop in the tracheids, break up, and form into yellow gum. Mycelium is seldom present in the bark, reaching only the cortical medullary rays. Invasion of the young wood spreads from the roots or collar towards the trunk and branches, progress being relatively rapid. The parasite may be present where no symptom is visible macroscopically. By the time outward symptoms become apparent infection may be considerable.

Numerous isolations from affected material all gave a *Fusarium* apparently of the *oxysporum* group. It differs from *F. xylarioides* [cf. *R.A.M.*, 28, p. 31] in several respects. In culture the fungus formed very dark, greenish-blue sclerotia. Microconidia developed in small clusters at the extremity of short, lateral conidiophores or in false heads on the aerial mycelium or in pale orange-pink, widely spreading pionnotes; they were often unicellular or uniseptate and usually reniform. In certain conditions the macroconidia developed in light brownish-pink, mucous masses; most had three septa, others had two, four, or five; they were somewhat asymmetrical and strongly curved, the apical cell gradually tapered to a short beak, and the basal cell, which narrowed more abruptly, was often pedicelloid or papillate. The spores ranged from 8 by 3 to 40 by 3·5 μ.

If epidemic outbreaks occur the dead trees should be pulled up and burnt. In present circumstances the best means of control consists in selection for resistance, as differences in susceptibility appear to exist in the different Robusta lines.

Duddington (C. L.). **Fungi that trap eelworms.**—*Bull. Mushroom Grs' Ass.* 20, pp. 191–196, 3 figs., 1950.

The author discusses nematode-catching fungi, of which 30 species have been found in Britain, and the methods by which they capture eelworms [*R.A.M.*, 29, pp. 303, 304]. The chief fungi noted are *Trichothecium flagrans* which produces an adhesive mycelial network, *Arthrobotrys oligospora*, *Dactylella ellipsospora* [ibid., 22, p. 306] which uses adhesive knobs, and *D. bembicoides* [ibid., 26, p. 106] using mycelial rings. A number of fungi parasitic in eelworms include *Harposporium anguillulae* [loc. cit.] and *Acrostalagmus obovatus* [ibid., 25, p. 393].

Breny (R.). **L'action des ennemis naturels indigènes sur le Doryphore en Europe.** [The action of the indigenous natural enemies of the Colorado beetle in Europe.]—*Parasitica*, 6, 1, pp. 23–36, 1950. [Flemish, English, and German summaries.]

Although entomogenous fungi such as *Beauveria effusa* and *B. doryphorae* are known to kill up to 50 per cent. of the enfeebled and hibernating Colorado beetles

(*Leptinotarsa decemlineata*) in France and Belgium and other potato-growing areas [*R.A.M.*, 18, p. 591], they are unable, even under favourable conditions, to control the vast underground population of this insect.

Nicklová-Navrátilová (Mme H.). **Tři čtvrti roku zahradnické praxe očima fytopatologa.** [Three quarters of a year of gardening practice through the eyes of a phytopathologist.]—*Ochr. Rost.*, 22, 5–6, pp. 238–256, 1949.

The author presents a comprehensive account of fungal and bacterial diseases of ornamentals, encountered by her from 1948 to 1949 in a nursery in Czechoslovakia.

Of the many damping-off fungi, *Moniliopsis aderholdi* [*R.A.M.*, 28, p. 499] was the most dangerous. It attacked especially *Begonia semperflorens*, *Primula obconica*, *Cyclamen*, carnation, and *Gloxinia* seedlings, and cuttings of various plants. Cuttings (particularly *Hydrangea*) were frequently destroyed by *Bacterium* [*Pseudomonas*] *fluorescens* [ibid., 28, p. 446] at high temperatures (20 to 30° C.). Other parasites attacking cuttings included *Pythium debaryanum* [ibid., 29, p. 119], *Phytophthora omnivora* [*P. cactorum*: ibid., 17, p. 584; 28, p. 228], species of *Fusarium*, *Fuligo septica* [ibid., 23, p. 347; 25, p. 536], and *Pseudomonas fluorescens*.

Other pathogens frequently observed included *Stagonospora crini*, which was widespread on leaves and bulbs of *Hippeastrum* [ibid., 13, p. 772]; *Septoria brachyspora* on *Ficus elastica*; *Oidium hortensiae* [*Microsphaera polonica*: ibid., 27, p. 422] and *Phyllosticta hydrangeae* on *Hydrangea*; a very destructive species of *Phytophthora* [cf. ibid., 23, p. 390] and *Pseudomonas fluorescens* on *Gloxinia*; *Phytophthora richardiae* [ibid., 29, p. 112], *Bacillus* [*Erwinia*] *aroideae*, and *E. carotovora* on *Zantedeschia aethiopica*; *P. cactorum*, *P. cryptogea* [ibid., 17, p. 181], *F. pyrochroum* [*Gibberella baccata*], *F. conglutinans* var. *callistephi* [ibid., 29, p. 145], and *Verticillium albo-atrum* [ibid., 20, p. 118] on China aster; and *S. chrysanthemella* [ibid., 29, p. 154] on *Chrysanthemum indicum*.

Příhoda (A.). **Gloeosporiové žloutnutí pokojových Fíkovníků.** [Gloeosporiosis causing yellowing of indoor Fig plants.]—*Ochr. Rost.*, 22, 5–6, pp. 235–237, 1 fig., 1949.

A brief description is given of the symptoms, morphological characters, and taxonomy of *Gloeosporium elasticae* (a conidial state of *Glomerella cingulata*) [*R.A.M.*, 29, p. 157], which frequently occurs on indoor *Ficus elastica* plants in Czechoslovakia. The fungus causes premature yellowing and shedding of the leaves.

Lalelerimizde raslanılan bir hastalık. Ustilago tulipae Rbh. [Tulip smut (*Ustilago tulipae* Rbh.).]—*Mahsul Hekimi* (*Plant Prot. J.*), 3, 5, p. 115, 1 fig., 1950. [French summary.]

Ustilago tulipae [*R.A.M.*, 13, p. 656] is reported on tulips in Turkey.

Roland (G.). **Recherches virologiques sur Isoloma hirsutum, Pogostemon patchouli et Salvia splendens.** [Virological researches on *Isoloma hirsutum*, *Pogostemon patchouli*, and *Salvia splendens*.]—*Parasitica*, 6, 1, pp. 8–13, 2 pl., 1950. [Flemish summary.]

Researches were carried out from 1947 to 1949 at the State Phytopathological Station, Gembloux, on greenhouse specimens of *Isoloma hirsutum*, *Pogostemon patchouli*, and *Salvia splendens* with virus infections.

The leaves of *I. hirsutum* bore greyish rings. Sap inoculations to White Burley tobacco varieties and other properties showed that the causal virus was tobacco mosaic virus, for which *I. hirsutum* is a new host.

The spots on the leaves of *P. patchouli* were sometimes pale green, sometimes yellowish. Occasionally the yellowish spots seemed to have parallel arcs between

them, sometimes constituting concentric rings. Sap inoculations produced necrotic rings on the leaves of tobacco and *N. glutinosa*. In certain cases in the former they were reduced to small lines often in the region of the veins. The virus spread throughout the plant, into the roots and apparently healthy leaves as well as in necrotic leaves. Nine days after inoculation the rings on the leaves of *N. glutinosa* became large, dark brown necrotic spots with concentric zones. Sap inoculation produced pale areas on the leaves of Record potatoes, the entire foliage eventually being affected. On tomato the virus produced small brown necrotic spots leading to the death of the leaflets when they became numerous. The virus was inactivated after heating for 10 minutes at 70° C. Although it resembled *Nicotiana* virus 11 [tobacco necrosis virus] in the symptoms produced on the above hosts, it differed in not being soil-transmissible and in not producing symptoms on *Capsicum annuum*, *Datura stramonium*, spinach, *Tropaeolum majus*, broad bean, garden pea, and *Phaseolus vulgaris*. Accordingly the name *Pogostemon* virus 1 is proposed.

The *S. splendens* plants showed vein-clearing and chlorosis. All attempts at sap transmission proved unsuccessful. However, three cucumber plants inoculated by means of *Myzus persicae*, which had fed for 3 minutes on leaves of *S. splendens*, developed severe vein-clearing and chlorosis followed by stunting of the plants. Similarly inoculated *D. stramonium* plants remained unaffected. In the absence of a virus producing similar symptoms on *Salvia* and cucumber the name *Salvia* virus 1 is proposed.

Beaumont (A.). **Diseases of shrub Veronicas.**—*Gdnrs' Chron.*, Ser. 3, 128, 3324, p. 128, 1 fig., 1950.

Septoria exotica [*R.A.M.*, 28, p. 595] is particularly abundant on leaves of shrubby species of *Veronica* in the Scilly Isles, where Bordeaux mixture, used in Italy with good results [ibid., 16, p. 463], should prove satisfactory in controlling the disease. Downy mildew (*Peronospora grisea*) is not uncommon in the south of England, including the Scilly Isles [ibid., 16, p. 515].

Quillon (P. J.). **Sur un Pyrénomycète peu connu, parasite de l'Amorpha fruticosa L.** [Concerning a little-known Pyrenomycete, parasitic on *Amorpha fruticosa* L.]—*Bull. Soc. mycol. Fr.*, 65, 3–4, pp. 171–174, 1 fig., 1950.

In October, 1948, the author observed wilting of certain branches of the ornamental shrub *Amorpha fruticosa* in the Botanic Garden of the National School of Horticulture, Versailles. Microscopical examination of numerous pustules on the affected limbs revealed perithecia of a fungus identified as *Eutypella amorphae*. It is believed to be new to the French mycoflora and has been regarded hitherto as a saprophyte.

Williams (W.). **The present position in the breeding of herbage legumes.**—*Ann. appl. Biol.*, 37, 2, pp. 310–313, 1950.

Breeding for disease resistance in herbage legumes [in the British Isles] is of major importance only in the case of red clover, which suffers severe losses from *Sclerotinia trifoliorum* [*R.A.M.*, 29, pp. 467, 565, and next abstracts]. Certain strains are available which show some field resistance to the disease, but unfortunately they are not of the agronomic type which is required on the one-year ley lands where the pathogen is most serious. In spite of many studies in various institutions in Europe, no genotype showing clear-cut resistance has been found in clover. A laboratory infection method has recently been developed [loc. cit.].

Justham (M[oira]) & Ogilvie (L.). **Clover rot investigations.**—*Ann. appl. Biol.* 37, 2, p. 328, 1950.

Investigations into clover rot (*Sclerotinia trifoliorum*) [see preceding and next

abstracts] have been proceeding since 1944 in the laboratories of the National Advisory Service, Bristol.

In the south-west of England apothecia of the fungus are produced mainly in October and November, and rotting of the clover plants sets in usually about March. Applications of certain nitrogenous compounds, of grass cuttings, and of extracts of crop plants helped to eliminate sclerotia. Heavy rains cause retardation of spore discharge and decay of apothecia, whereas dry weather is favourable to apothecial survival. Many years with an exceptionally dry November were followed by a high incidence of clover rot in the spring. Spread from plant to plant takes place chiefly along affected petioles, but the pathogen may grow about 2 cm. over the soil from a food base. Antibiotics present in the soil probably prevent spread. *S. trifoliorum* can persist in the crown of the plant throughout the summer till the harvest. The authors isolated the fungus only once from surface-sterilized seed.

It is recommended that resistant leafy white clovers like S 100 be substituted for broad red clovers in 3-year ley mixtures. This proved an efficient control measure in the south-west.

Dillon Weston (W. A. R.). **Clover sickness.**—*Ann. appl. Biol.*, 37, 2, pp. 320–323, 1950.

Most of the information in this historical survey and record of the incidence of clover sickness and its relation to *Sclerotinia trifoliorum* [see preceding and next abstracts] has already been noticed from another source [*R.A.M.*, 29, p. 512].

Mann (H. H.). **Notes for paper on Clover sickness (non-parasitic).**—*Ann. appl. Biol.*, 37, 2, pp. 327–328, 1950.

Clover crops frequently failed at Woburn [Bedfordshire] about 50 years ago and the same trouble still occurs. At the Woburn Experimental Station, Bletchley, *Sclerotinia trifoliorum* [see preceding and next abstracts] was absent from plots on which clover was grown once in four years [*R.A.M.*, 17, p. 825], but the clover eelworm [*Anguillulina dipsaci*] was found in some though not in all cases.

In a pot test with soil from these plots the size of plants decreased gradually when red, alsike, Dutch, and crimson clovers were grown year after year (re-seeding twice a year), and after about two to five years only dwarf plants could be produced even in the absence of eelworms or fungus. By increasing the proportion of clover to soil, i.e. by growing as much clover as could be crowded into a pot on very shallow soil, the soil became 'sick' much more rapidly, which suggests that clover possibly produces a substance in the soil which is harmful to its further growth. The addition of large amounts of farmyard manure to the 'sick' soil at once resulted in a normal growth of clover, but the effect was not lasting. Normal growth was also obtained by heating the soil in a moist condition to 70° F. for two hours, while heating in a dry condition had little effect. Further work is in progress.

Pohjakallio (O.). **Om orsakerna till resistens mot Sclerotinia trifoliorum.** [On the causes of resistance to *Sclerotinia trifoliorum*.]—*Nord. JordbrForskn.*, *1948*, 1–3, pp. 598–605, 1948.

According to the author's observations in Finland, reported in this paper read at the Seventh Congress of the Norwegian Association of Land Utilization Research, at Oslo, in July, 1947, the foliage of white clover is almost as susceptible to *Sclerotinia trifoliorum* [*R.A.M.*, 29, p. 565, and preceding abstracts] as that of red clover, the greater resistance of the former as a whole being presumably attributable to its tendency to produce runners. Lucerne leaves, too, may be totally destroyed by the clover rot pathogen, but it takes a long time to reach the root system through the comparatively thick stem, while a measure of protection is further conferred

on this host by its capacity to form new shoots, probably at a greater depth in the soil than the aerobic fungus can penetrate. Little information is available regarding the factors determining the resistance to *S. trifoliorum* of different plants, or of the same plant at various stages of development, but there is reason to believe [ibid., 6, p. 501] that they are non-mechanical and probably reside in the chemical constitution of the middle lamella, the dissolution of which is accomplished by the toxic enzymes secreted by the pathogen.

On living carrot roots, both wounded and intact, inoculated with mycelium, sclerotia were produced in abundance, and they were also formed on the cut surface of living potato tubers, though rather less freely than on autoclaved material. Infection resulted in several instances when the mycelium was applied to the delicate, washed skin of a young tuber, but the uninjured skin of mature tubers proved uniformly resistant. From these tests it is clear that the resistance of potato tubers to *S. trifoliorum* rests on a combination of the passive protection afforded by the skin and the vital functions of the tuber.

The normally immune *Phleum pratense*, *Dactylis glomerata*, oats, and barley, after autoclaving or treatment with oxalic acid solutions, provided suitable substrata for the clover rot fungus, showing that here, too, the vital functions are concerned in the reaction. The same plants sustained no damage from immersion in the sclerotial filtrate, the toxicity of which to red clover was variable. The chemical composition of the filtrate from sclerotia and other parts of the mycelium was found to differ to some extent from that of the secretion with which the fungus kills the protoplasm of the host and divides the cellulose cell walls.

When red clover, *P. pratense*, oats, and barley, deprived of chlorophyll by cultivation in darkness, were inoculated with the mycelium of *S. trifoliorum*, the clover tissues died and turned dark brown as soon as the fungus began to spread through them, whereas the grasses survived for some days after complete encirclement by the mycelium. Since *S. trifoliorum* is capable of growth on these resistant grasses in the absence of chlorophyll, the latter substance must exert some influence on their normal reaction. It is apparent from some of the author's experimental data that clover, as well as the grasses used in the tests, harbours a principle, bound up with the chlorophyll or assimilatory function, inimical to *S. trifoliorum*, but that its operation in clover is impeded by the destruction of the host plastids by the fungal toxin. When sterile red clover, *P. pratense*, oats, and barley plants were killed by freezing at −6° to −10° C. and then inoculated with the mycelium of *S. trifoliorum*, all those without chlorophyll were permeated by the fungus, whereas it refused to grow even on clover provided it was still green.

Tverskoi (D. L.), Zhukova (Mme K. P.), & Navsutz (B. S.). Причины выпадения сеянцев Клевера в Московской области и меры борьбы с ними. [Causes of Clover seedling failures in the Moscow district and control measures.] —*C. R. Acad. Sci. agric. U.R.S.S.*, *1950*, 5, pp. 22–29, 1950.

In 1947 clover failure in the Moscow district amounted to more than 80 per cent. In 1949 in the drier southern areas of the district 18 per cent. of the seedlings were diseased, and 85 per cent. in the more humid northern parts. At the Sukhanovo State farm 27 per cent. of the diseased seedlings died and 45 per cent. at the Moscow Experimental Station, Ermolino, the losses being greatest during a hot, dry period in June and July.

In investigations carried out in 1949 at the Moscow Experimental Station a species of *Fusarium* [cf. *R.A.M.*, 25, p. 13; 26, p. 110] was most frequently isolated from diseased red clover seedlings, followed by species of *Rhizoctonia* [ibid., 19, p. 322] and *Pythium*. *Thielaviopsis* sp. [ibid., 27, p. 123] was less common. Many seedlings had infected root systems (11 to 45 per cent.); isolations yielded *Fusarium* in 32·6 per cent. of the cases and an [unspecified] bacterium in 53·8

per cent. The same pathogens were isolated from roots of two- and three-year-old plants. Further studies are necessary, but it is suggested that these agents may be closely connected with the clover failure.

The pathogenicity of these fungi to clover seedlings and various young cereal plants was tested by soil inoculation. The infections caused by *Fusarium* sp. on clover, winter wheat, spring wheat, and rye were 100, 65, 70·6, and 75 per cent., respectively, the percentages of seedlings killed being 30·4, 0, 6·1, and 16·6, respectively; by the *Rhizoctonia* 100, 27·7, 54, and 75 (36·6, 0, 31, and 37·4); by *Pythium* sp. 100, 11·1, 36·3, and 16·6 (clover only killed, 91·4 per cent.); *Thielaviopsis* sp. infected only clover (100 per cent., with 7·6 per cent. killed).

The results of tests in which the effect of soil humidity (40, 60, and 90 per cent.) on the development of the fungi was examined showed that *Fusarium* sp. and *Rhizoctonia* sp. are favoured by low soil humidity, while *Pythium* sp. is most virulent at 90 per cent.

In laboratory tests in 1948 the addition of mineral or organic fertilizers alleviated disease incidence. The best results were obtained with a complete mineral fertilizer, phosphorus and potassium combinations, and farmyard manure. Field experiments in 1949 showed that lime plus a complete fertilizer was most effective if applied during autumn ploughing (12·5 per cent. infection the following season compared with 22·4 for the untreated), followed by lime plus phosphorus and potassium (15·7). In spring, applications of lime plus phosphorus and potassium (both at 60 kg. per ha.) were the most beneficial (10·1 per cent. infection, control 30), followed by lime plus complete fertilizer (11·2). Manure applications were also very effective at 80 and 40 t[ons] per ha., the infection rates being 4·5 and 11·6 per cent., respectively (control 35·2).

On poor, acid soils where the seedling losses are highest it is recommended that lime and nitrogen be applied to the winter cover plants before the clover is sown, and the phosphorous and potassium added at the time of sowing. Clover seed should be treated with granosan (1 gm. per kg. seed) [cf. ibid., 19, p. 415].

Dunne (T. C.). **Regeneration of a subterranean Clover pasture with molybdenum.** —*J. Dep. Agric. W. Aust.*, Ser. 3, 27, 1, pp. 118–120, 2 figs., 1950.

In September, 1947, a field at Donnybrook, Western Australia, which supported a fair growth of *Phalaris tuberosa* and a small amount of subterranean clover [*Trifolium subterraneum*] with symptoms resembling those of molybdenum deficiency [*R.A.M.*, 22, p. 27; 24, p. 316; 29, p. 54], received three fertilizer treatments; roasted molybdenite (55 per cent. molybdenum), 4 oz. per acre; zinc sulphate (25 per cent. zinc), 10 lb. per acre; and the two together. In subsequent years only superphosphate was applied. No benefit was observed until 1949, when the molybdenum-treated plots became dominated by large-leaved subterranean clover whereas that which had persisted in the remainder of the field was spindly, with small, thin, yellow leaves.

Dunne (T. C.) & Elliott (H. G.). **Zinc fertilisers for subterranean Clover at Kendenup.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 27, 1, pp. 115–117, 2 figs., 1950.

Recently cleared land in the Kendenup area of Western Australia failed to give satisfactory mid-season crops of subterranean clover [*Trifolium subterraneum*: *R.A.M.*, 28, p. 629] in spite of liberal manuring with superphosphate, the plants presenting a stunted appearance, with dull yellow leaves with brown, dead areas. In June, 1949, the following treatments were applied: (1) 168 lb. superphosphate per acre alone, (2) the same plus copper ore (10 per cent. copper) at 12½ lb. per acre, (3) plus zinc oxide at 4 lb. per acre, and (4) plus both copper ore and zinc oxide [cf. above, p. 612]. The plots treated with zinc oxide developed a luxuriant cover of subterranean clover with leaves up to 1½ in. across, while those without were

little better than the untreated. The rest of the field was then treated with a mixture of superphosphate with 5½ lb. zinc sulphate per acre and a heavy crop of clover resulted.

Vasudeva (R. S.) & Roy (T. C.). **The effect of associated soil microflora on Fusarium udum Butl., the fungus causing wilt of Pigeon-pea (Cajanus cajan (L.) Millsp.).** —*Ann. appl. Biol.*, 37, 2, pp. 169–178, 3 graphs, 1950.

Experiments carried out over a number of years at the Indian Agricultural Research Institute, New Delhi, showed that inoculation with *Fusarium udum* [*R.A.M.*, 29, p. 250] in sterilized soil produced more wilt of pigeon pea than in unsterilized soils at the same pH. Of the fungi isolated from unsterilized soils with low disease incidence, *Aspergillus niger* and *A. terreus* secreted inhibitory substances in potato dextrose broth after ten days' growth, but *Bacillus subtilis* appeared to be the principal inhibitory agent. It inhibited *F. udum* on solid media and also produced a toxic substance in potato dextrose broth. The nature of the medium employed and period of growth were important factors in the production of the thermostable, inhibitory principle. The low incidence of *A. terreus*, *A. niger*, and *B. subtilis* in local soils during November, and their subsequent low level until the end of the cropping season, corresponds to the high incidence of the disease during this period. The low incidence of pigeon pea wilt in unsterilized soils may probably be explained by the inhibitory activity of the associated soil microflora.

Ramakrishnan (T. S.) & Srinivasan (K. V.). **Two grass smuts.**—*Curr. Sci.*, 19, 7, pp. 216–217, 2 figs., 1950.

Between November, 1949, and February, 1950, a species of *Entyloma*, referred by M. B. Ellis, of the Commonwealth Mycological Institute, to *E. dactylidis*, was collected on the leaves of *Dactylis glomerata* in Ootacamund, Madras. The amphigenous, quasi-rectangular, brown, pseudoparenchymatous sori, 0·25 to 1·5 by 0·1 to 0·3 mm., are delimited by the veins and lie between the two epidermal layers, which did not rupture to liberate the polygonal, dark brown, smooth-walled spores, measuring 12 to 20 by 8 to 14 (mean 13·5 by 12) μ. This is the first record of the smut for India.

Ustilago tragana is prevalent on *Tragus racemosus*, a common grass at Coimbatore.

Boulais (J.). **Lavage des fruits par centrifugation.** [Fruit washing by centrifugation.]—*Fruits d'Outre-Mer*, 5, 6, pp. 220–221, 1 pl., 1950.

A new immersion fruit-washing machine is described. The fruits are poured into a transfer tank, from which they are drawn towards a vortex by means of a centrifugal pump and sucked up with the water to the top of a 'chimney', and released into a gutter before reaching the brushes. From the gutter the water goes back to the tank and the process is repeated. Immersion in the tank removes only slightly adherent particles, while the violent movements in the vortex remove those which do not respond to ordinary immersion. In the pump chamber, where the fruits rotate for a certain time under a strong current of water continually renewed, the washing attains its maximum efficiency. On emergence the washed fruits appear perfectly clean, and no damage is caused even to tomatoes.

Mulder (D.). **Magnesium deficiency in fruit trees on sandy soils and clay soils in Holland.**—*Plant and Soil*, 2, pp. 145–157, 1 col. pl., 1 graph, 1950.

A tabulated account is given of the unpublished studies of Miss J. Ter Kuile on magnesium deficiency of fruit trees in Holland [*R.A.M.*, 29, p. 262], which was first observed on a sandy soil near Breda and has since been encountered also on clay. In contrast to potassium deficiency, a shortage of magnesium generally

results in necrosis of the centre rather than the margins of the leaf and there is no reduction in leaf size. A further symptom of magnesium deficiency is a broad, yellow marginal zone with interveinal extensions. In the Manx Codlin apple variety these symptoms are not clearly differentiated from those of potassium deficiency, as in Zigeunerin, Signe Tillisch, and Yellow Transparent, and a more reliable diagnostic criterion, therefore, is the defoliation induced by a lack of magnesium but not of potassium. Ripening of apple fruits is delayed and their consistency toughened by magnesium deficiency, suggesting the possibility of a connexion with bitter pit [ibid., 25, p. 128].

The analysis of samples from healthy and diseased apple shoots and fruit buds from four orchards affected by magnesium deficiency revealed four to six times as much of the element in the former as in the latter, while the potassium content of leaves from affected trees was 25 to 50 per cent. higher than that of healthy foliage. Four applications of a 2 per cent. magnesium sulphate spray (on 24th May, 9th and 26th June, and 14th July, 1947) gave very encouraging results on the Zuccamaglio, Jonathan, and Cox's Orange Pippin apple varieties [cf. ibid., 28, p. 177]. Though perfect control was not achieved, the treated trees sustained less extensive defoliation while marginal chlorosis and interveinal necrosis were less pronounced. In severely affected orchards six treatments or a higher concentration of magnesium sulphate would probably be necessary to ensure absolute control.

The symptoms of magnesium deficiency on cherry and Louise Bonne d'Avranches pear leaves, as well as on apple, are shown on the coloured plate.

Granny Smith Apples in cold storage.—*Agric. Gaz. N.S.W.*, 61, 5, p. 264, 1950.

Measures for preventing losses of Granny Smith apples due to superficial scald include, in addition to those already recommended [*R.A.M.*, 26, p. 229; 29, p. 314], picking the fruits when the dark green colour changes to a paler shade and selecting only sound, small to medium sized fruit for long storage.

Harris (W. B.). **Ground sprays for control of Apple scab.**—*J. Dep. Agric. Aust.*, 53, 12, p. 543, 1950.

In trials carried out in South Australia ground sprays, used to clean up badly sprayed or neglected orchards to a point where efficient control of apple scab [*Venturia inaequalis*: *R.A.M.*, 27, p. 568] could be obtained with the normal spring programme, resulted in approximately 10 per cent. improvement in control. In closely planted districts ground spraying would have to be carried out in several neighbouring orchards in order to be fully effective. Since 400 to 600 gals. spray per acre are required to cover all the fallen leaves adequately this would cost approximately £5 per acre for spray materials. In most orchards, however, good control of ascospore infections can be achieved by thorough spring spraying, so that the high cost involved in ground spraying and the negligible improvement in the control of scab likely to be obtained in most orchards do not warrant its use as a regular practice. Its main value would appear to be in neglected orchards or where the spring programme does not satisfactorily control the disease.

Torikata (H.). **Studies on the resistance of the Japanese Pear to black-spot disease (Alternaria kikuchiana Tanaka). (1) On the varietal resistance of the Pear and the toxic substance as a cause of the disease.**—*J. hort. Ass. Japan*, 16, pp. 181–191, 1947. [Japanese. Abs. in *Hort. Abstr.*, 20, 2, p. 97, 1950.]

When cultivated in leaf extracts or fruit juice of resistant and susceptible varieties the pear black spot fungus (*Alternaria kikuchiana*) shows no appreciable difference in its development. The fungus, however, excretes a non-volatile toxic substance into the fruit juice which has a direct effect on resistance and susceptibility to the disease. The substance is absorbed by animal charcoal in a slightly alkaline

solution, but not by aluminium hydroxide. Its toxicity is lost at 80° C., and its effect is diminished by low temperatures and reduced pressure.

Biraghi (A.). **Una probabile nuova virosi del Pesco.** [A probable new virus disease of Peach.]—*Ann. Sper. agr.*, N.S., 4, 1, pp. 103–107, 2 figs., 1950. [English summary.]

An account of this work has been noted from another source [*R.A.M.*, 29, p. 315].

Minz (G.). **Peach pocket.** —*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 185–186, 1 fig., 1949. [Hebrew summary. Received August, 1950.]

During 1946 the author found in a peach orchard at Rehovot fruits of the C. O. Smith variety attacked by *Taphrina deformans* [C.M.I. map. No. 192] recorded for the first time [on this host] in Israel. In 1949 epiphytotics of leaf curl occurred on various peach varieties throughout the country, fruits of the C. O. Smith variety in the same orchard again being affected. This time, however, the fruits were misshapen in a manner resembling plum pocket disease (*T. pruni*).

Zacha [V.]. **Přehlížená choroba Meruněk.** [An overlooked disease of Apricots.]—*Ochr. Rost.*, 22, 5–6, p. 258, 1949.

In July, 1949, the author received a sample of diseased, ripe apricot fruits with corky skins from the Znojmo district, Czechoslovakia. On the surface were small, greyish spots (1 to 5 mm. in diameter), which sometimes coalesced, and the tissue underneath dried and fell out. Here and there on the lesions were black pycnidia, with abundant, hyaline, unicellular spores, measuring approximately 3 by 1 μ. The description agrees with that of *Phoma armeniacae*. It appears that the disease is widespread, although it is usually attributed to physiological causes.

Palti (J.), Moeller (S.), & Reichert (I.). **Trials for the control of Olive leaf spot.** —*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 167–173, 2 figs., 1949. [Hebrew summary. Received August, 1950.]

From 1943 to 1946 trials on the control of olive leaf spot (*Cycloconium oleaginum*) [*R.A.M.*, 26, p. 160; 28, p. 465; and C.M.I. map. No. 183] were carried out on the susceptible Syrian and less susceptible Ascolano varieties at Mikve Israel, near Tel Aviv, where the disease is often severe, and on the Syrian variety at G'vat, in the Western Valley of Esdralon, where disease development is more limited. Under conditions of severe infection the disease was satisfactorily controlled by 1 per cent. Bordeaux mixture (0·25 per cent. copper) and by $\frac{1}{3}$ per cent. perenox (0·17 per cent. copper), applied in summer and autumn or early winter. A single summer application largely controlled the disease under conditions of moderate infection. Disease incidence was assessed by the method already described [see next abstract].

Palti (J.). **Methods of assessing the incidence of Olive leaf spot. A contribution to the technique of plant disease estimation.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 156–166, 1949. [Hebrew summary. Received August, 1950.]

Methods of assessing accurately the incidence of olive leaf spot (*Cycloconium oleaginum*) [see preceding abstract] were developed at the Division of Plant Pathology, Rehovot, Israel. The assessments take into account the state of infection of leaves persisting on the tree as well as the defoliation caused by the disease.

The leaves on the tree were sampled from 12 or 16 selected leafy twigs, 3 or 4 being situated on each of the north, south, east, and west sides. After the leaves under the tree had been cleared two or three frames, each delimiting an area of 0·75 sq. m., were placed on the ground. At each appraisal 100 leaves in each frame were collected at random. The unit of appraisal was a single leaf. The

categories of appraisal varied from (*a*) healthy to (*f*) very severe infection with more than three-quarters of the leaf surface affected. Each of the leaves persisting on the labelled twigs was assigned to one of the above categories and the number of leaves shed from the twig recorded. In order to evaluate disease incidence scales of marks, 0, 1, 2, 4, 6, and 8, were allotted to the categories (*a*) to (*f*). The influence of external factors such as wind were ignored.

The evaluation of disease incidence on each twig proceeded as follows. The number of leaves persisting on the twig in each of the categories of appraisal was multiplied by the number of marks assigned to that category. The total for all categories was referred to as 'total marks for persisting leaves'. The same method of evaluation was employed for the shed leaves, but the total marks were divided by the number of leaves in the sample to obtain the average infection mark. This was multiplied by the number of leaves recorded to have been shed from the twig, thus giving 'total marks for shed leaves'. The totals were added and the resultant figure divided by the number of leaves originally on the twig. This yielded an average disease rating for the twig for the purpose of phenological study.

In attempting to express the measure of economic loss caused by the disease it was assumed that the shedding of infected leaves was due solely to infection. The total marks for persisting leaves were calculated as before. The number of infected and sound shed leaves was determined without distinguishing the degree of infection. The number of infected leaves in the sample was multiplied by the number of marks given for the highest category of infection, and the result divided by the number of leaves in the sample. The other calculations proceeded as for phenological studies.

The merits of including defoliation data in disease estimations is discussed. In spite of the dependence of the amount of leaf fall on external conditions, estimation of infection on the leaves shed is considered to be indispensable in olive leaf spot studies, especially where infection of the leaves persisting on the tree is slight and where strong winds prevail.

Verona (O.). **Sopra i microorganismi presenti nelle Olive colpite da 'Dacus oleae' e sulla loro attività lipolitica.** [On the micro-organisms present in Olives damaged by *Dacus oleae* and their lipolytic activity.]—Reprinted from *Olearia*, *1950*, 3–4, 9 pp., 7 figs., 1950. [French, English, and German summaries.]

From olive fruits attacked by *Dacus oleae* and still attached to the tree the author isolated *Candida olea*, *Geotrichum candidum*, *Acremoniella atra*, *Aspergillus glaucus*, *Cephalosporium* sp., *Fusarium* sp., *Penicillium chrysogenum*, and *Rhizopus nigricans* [*R. stolonifer*], while from olives infested by the same insect and found lying on the ground he obtained *Aspergillus niger*, *Cladosporium herbarum* [*R.A.M.*, 7, p. 187], *Fusarium herbarum* var. *avenaceum*, and *Trichothecium roseum*. Of these, *Acremoniella atra*, *F. herbarum* var. *avenaceum*, *T. roseum*, and *Cephalosporium* sp., when tested by Eyre's method [ibid., 12, p. 47], showed evidence of lipolytic activity.

Mezzetti (A.). **Altre osservazioni sulla 'defogliazione del Kaki'.** [Further observations on leaf fall of Persimmon.]—*Ann. Sper. agr.*, N.S., 4, 2, pp. 291–294, 1950. [English summary.]

The leaf fall of persimmons recently reported from Italy [*R.A.M.*, 27, p. 327] has now been found in the provinces of Brescia, Verona, Vicenza, Padua, Imperia, Savona, La Spezia, Rome, Frosinone, Latina, Pescara, Chieti, Naples, and Salerno, and the available evidence leads the author to believe that it is probably due to a filterable virus and is spread by grafting and in other ways not yet ascertained. One plant protected from insect infestation and grafted with affected material in the

spring of 1948 developed characteristic symptoms in the summer of 1949. A severely affected planting made in 1940–1 was dug up in the winter of 1947–8, about ten of the plants, which still appeared to be healthy, being transferred to an adjacent plot; in the summer of 1948 some of these developed severe symptoms. The author also observed the symptoms on one branch only of plants 15 to 20 years old which had previously appeared quite healthy. The disease also made a temporary appearance on a single, very old tree in a garden at Sarzana, where the neighbourhood contains many persimmons. Environmental conditions strongly affect the severity of the symptoms, which usually persist for a year or two and then disappear. Good results have followed improvement in cultural conditions, the application of nitrogenous fertilizers in spring, and spraying with 1 per cent. Bordeaux mixture in the middle of May.

Merny (G.). **Traitements contre Cercospora musae à la Jamaïque.** [Treatments against *Cercospora musae* in Jamaica.]—*Fruits d'Outre-Mer*, 5, 3, pp. 89–92, 6 figs., 3 diags., 1950.

In Jamaica, Bordeaux mixture composed of 1 kg. copper sulphate, 1·25 kg. lime, and 100 l. water is used for spraying bananas against leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, 29, p. 459]. The extra lime makes up for the lack of a wetter and ensures the neutral reaction of the mixture. The variety Gros Michel is treated every month and Lacatan every three weeks, about 1 l. of the mixture being applied to each mother plant and shoot. The entire leaf surface of the plant is covered at each treatment. After picking, the fruit is dipped in a solution of sodium bisulphate, 33 kg. to 1,200 l. water. A description is given of the principal types of spraying apparatus employed, including (1) two types of hand pump for treating, respectively, areas under 10 acres and up to 15 acres; (2) a small, high pressure, double action motor pump distributing 2½ gals. of spray per minute; and (3) a large, 4-cylinder motor pump distributing 15 to 18 gals. per minute, used for plantations of 250 to 300 acres. The components of these pieces of apparatus are easily separated to facilitate their transportation over difficult country.

Effets de Cercospora musae sur Musa sinensis (variété Grande naine). [Effects of *Cercospora musae* on *Musa sinensis* (Grande Naine variety).]—*Fruits d'Outre-Mer*, 5, 6, p. 200, 1 col. pl., 1950.

Sigatoka disease of bananas (*Cercospora musae*) [*Mycosphaerella musicola*: see preceding abstract] affects the varieties Poya, Grande Naine, and Petite Naine of *Musa sinensis* [*M. cavendishii*] in the West Indies, the attacks being of exceptional gravity. In the Ivory Coast [C.M.I. map No. 7] it is only of small economic importance on Petite Naine, possibly because of the absence of ascospores; in the Cameroons [*R.A.M.*, 27, p. 572] it occurs on Gros Michel.

Portères (R.). **La maladie physiologique de l'éventail foliaire et de l'engorgement du stipe des Bananiers dans l'Ouest africain.** [The physiological disease of leaf fan and stem congestion of Bananas in West Africa.]—*Fruits d'Outre-Mer*, 5, 6, pp. 208–213, 4 figs., 1950.

In French West Africa Chinese bananas (*Musa sinensis*) [*M. cavendishii*] are affected by a condition in which the new leaves as they emerge become superimposed so closely upon one another that they assume a fan-shaped appearance. The stipe appears to be surmounted by a bouquet of piled-up leaves, the false petioles of which are very short and very thick. The leaf blades are often crumpled or even torn as they emerge, have various marginal malformations, and do not widen out normally, the last blades to emerge being small, elongated, yellowish, and sometimes streaked with white.

The common sheath situated under the bouquet of leaves dilates under the pressure exerted by the growing inflorescence. This has to thrust aside the sheath tops of five to ten leaves simultaneously, whereas normally it does so one by one; this tight collar may resist it completely or partly. A timely, lateral incision of the swelling, assures the emergence of the inflorescence on this side and a good bunch of fruit develops. In extreme cases it opens of its own accord following laceration of the sheaths; if not, the cone of bracts and male flowers terminating the inflorescence may pass through the sheath terminally. The inflorescence may or may not have a sinuous, contorted stalk, sometimes twisted into a spiral; the 'hands' of flowers are deformed; and the bunch of bananas is small, widely 'open', and very irregular. Sometimes emergence of the inflorescence occurs very late or not at all, and decay [unspecified] is then very common in the bracts and stem.

The condition may occur at any time of the year. In French Guinea the fan formation and swelling may develop either during the rains or in the dry season. The malformations which develop in the dry season are very important. In the Ivory Coast fan formation occurs in the main dry season (January to February) and to a slight extent at the end of the first rainy season (June); subsequent swelling is particularly common during the rainstorms of February to March (up to April and May at Sassandra) and in the short dry season (August). In those parts of Guinea and Senegal which border the French Sudan, fan formation is common in the dry season, while swelling is equally so during the rainstorms and at the beginning of the wet season.

Fan formation is due to prolonged retardation in the growth of the stipe which may be caused by several factors: weather and edaphic conditions, defoliation by insects, loss of roots through attack by eelworm (*Anguillulina similis*) or infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, 18, p. 249], arrest of leaf functioning through sheath rot (*Marasmius stenophyllus*) [ibid., 28, p. 325], and unsatisfactory cultural methods.

Bunchy top survey on north coast.—*Agric. Gaz. N.S.W.*, 61, 4, p. 192, 1950.

Between 1st July and 31st December, 1949, in a further survey in New South Wales 2,382 banana plants affected by bunchy top [virus: *R.A.M.*, 29, p. 469] were detected in an area of 53,878 acres. In 1948 the figures were 3,065 in 64,304 acres.

American Chemical Society's Philadelphia meeting covers fungicides.—*Agric. Chemicals*, 5, 5, pp. 54, 87, 89, 1950.

At the National Meeting of the American Chemical Society at Philadelphia on 12th April, 1950, newer developments in fungicides were dealt with in seven papers which are briefly summarized. Dr. S. E. A. McCallan described the advances made during the past decade in methods of screening chemicals as possible fungicides [*R.A.M.*, 29, p. 370]. W. H. Tisdale and A. L. Flenner reported on dithiocarbamic acid derivatives, of which manganese ethylene bisdithiocarbamate appears promising. Dr. J. G. Horsfall discussed the fungitoxicity of heterocyclic nitrogen compounds. Acridine is unique among the unadorned nuclei in being fungitoxic, but toxicity may be imparted to other nuclei by the addition of polar groups other than chlorine, fatty acids being particularly effective; by conversion of the end ring to a *p*-quinoid structure as in phenothiazone, methylene blue, and thionine; and by conversion of the nitrogen to a quaternary ammonium form, which imparts strong toxicity. R. H. Gruenhagen, P. A. Wolf, and E. E. Dunn dealt with phenolic fungicides. Dr. G. L. McNew, dealing with the quinones, said that spergon [ibid., 29, p. 162] is one of the safest and most effective seed treatments for pea, Lima bean [*Phaseolus lunatus*], maize, and other crops, but phygon [loc. cit.] is preferable for spraying because it persists better on foliage and fruit. F. R. Whaley and J. B. Harry stated that field tests on potatoes demonstrated

that chromates [ibid., 29, p. 370] alone are not as fungicidal as copper alone, but synergism between the two was confirmed.

Summary tables of biological tests sponsored by the Chemical-Biological Coordination Center.—Published by the National Research Council, Washington 25, D.C., 1, 1, pp. 1–58; 2, pp. 59–121, 1949; 2, 1, pp. 1–77, 1950. [Mimeographed.]

The Chemical-Biological Coordination Center of the National Research Council [of the United States] was established in July, 1946, to assemble and organize information for correlating chemical structures (of fungicides, etc.) with biological activity, and to sponsor the preliminary screening of chemicals in relation to their biological effects on laboratory animals and plants, and the preparation of reviews on these subjects. Those submitting chemicals give records of their chemical and physical properties, biological effects, and amounts available for distribution. This information is circulated to sub-committee members and to those conducting the screening experiments; these are listed. The screeners indicate the minimum quantities of each compound required and submit the results. The information is filed and in time made available to authorized investigators. These are the first published, summarized accounts of such tests. The tables are arranged according to the type of test performed, that is antibacterial, fungicidal, etc., and the compounds are listed alphabetically under their chemical names together with their formulae. Descriptions of techniques are given.

In Volume 1, No. 1 the tables show that compounds active against plant-pathogenic bacteria include the trithio–tri–3–thienyl ester of phosphorous acid (at 0·06 mgm. per ml.); the following derivatives of thiophene: 2,5–bis (1,1,3,3,–tetramethylbutyl)– at 0·125 mgm., 2,5–dihydro–2,2,3,4,5,5–hexachloro– at 0·18 mgm., tetrahydro–2,2,3,4,5,5–hexachloro– at 1 mgm., tetrahydro–2,2,3,3,4,4,5,5–octachloro– (vapour), and the α-isomer of tetrahydro–2,3,4,5–tetrachloro– at 2·54 mgm.; 2,4,6–tris (*p*-hydroxyphenyl)–s–trithiane (0·14), and the sodium salt of ethyl–xanthic acid (0·078), all of which were active against *X*[*anthomonas*] *phaseoli* [cf. *R.A.M.*, 27, p. 189]. Fungicides effective against *Stemphylium sarciniforme* [cf. ibid., 27, pp. 32, 288, 484; 28, p. 181] were 5–iodo–acetylsalicylic acid (100 p.p.m.), aconitic acid (10), *o*, *o'*–dithiodi–aniline (10), 5–chloro–*o*–anthranilic acid (100), *p*–hydroxy–, *n*–butyl ester of benzoic acid (1,000), and 2–hendecyl–2–oxazoline (1,000).

In the second number the following compounds are listed as inhibiting growth of *Stemphylium sarciniforme* and *Sclerotinia fructicola* [cf. ibid., 28, pp. 469, 636]: 2–thienyl ketone, 3–(allylmercapto)–thiophene; and 3–thiophenethiol. Phenanthrene gave 58 per cent. inhibition of growth of *Aspergillus niger*. Against *X. phaseoli* 1,2–napthoquinone (at 0·1 mgm. per ml.), 3–(benzylmercapto)–thiophene (0·05), 3–thiophenethiol (2·27), and *o*–vanillin (0·12) were effective.

In Volume 2, No. 1, the following compounds are listed as giving 100 per cent. inhibition of growth of *Aspergillus niger*: isoeugenol; 3–hydroxy–2–naphthoic acid; *p*–toluic acid; and *o*–vanillin. Among others, *p*, *p'* biphenol gave 84, eugenol 74, dibenzofuran 73, and 1, 2–naphthoquinone 71 per cent. inhibition. Isophthalic acid (0·08 mgm. per ml.) and tartar emetic (0·15) are listed as toxic to *X. phaseoli*.

Sempio (C.) & Castori (Maria). **Estrema sensibilità dei conidi di Oidium monilioides per tracce di vapori di zolfo.** [Extreme susceptibility of the conidia of *Oidium monilioides* to traces of sulphur vapours.]—*Riv. Biol.*, N.S., 41, 2, pp. 163–172, 1 graph, 1949.

Experimental evidence showed that the conidia of *Oidium monilioides* [*Erysiphe graminis*] are highly susceptible to small doses of sulphur vapour [*R.A.M.*, 11, p. 731; 21, p. 422; 29, pp. 107, 161]. The parameters of the mechanism of this toxic action are essentially four; the surface area of the sulphur particles, which, for equal degrees of fineness, is a function of the weight; the volume of air into which

the vapours diffuse; the ambient temperature, which determines the rate at which the sulphur volatilizes; and conidial viability, as measured by the percentage germination and increase in length of the germ tube. The vapour only is sufficient to secure reduction in germination. Very dilute doses of sulphur vapour stimulated germination.

Churchill (L. J.). **Adapting home-made dusting machines for use on tractors fitted with hydraulic lifts.**—*J. Minist. Agric.*, 57, 3, pp. 128–130, 1 diag., 1950.

A description is given of a means of adapting home-made cage-type and ridge and rowcrop dusting machines [*R.A.M.*, 28, p. 23] for mounting on the hydraulic lifts of tractors in order to give rigid control on sloping ground, and to save time when turning at headlands. The adaptation consists of a framework of angle-steel, with side-arms for the dust container bolted across the front of the framework. In the working position the frame is attached to the tractor lift links so that the forward projecting bent arms lie under the links. The tractor can be backed up to the dusting machine and attached in a few seconds, using only the two lower links. With the lift lowered until the links are about 9 in. from the ground, the dusting machine framework will be approximately horizontal when working. The whole assembly works with a 'see-saw' action, pivoting in the ball and socket joints of the hydraulic lift arms. The best economical speed for this machine is 4 to 6 m.p.h. In a trial run of 30 min. at 5 m.p.h. approximately 1½ cwt. of dust was applied over 2 acres.

Hunter (A. W. S.) & White (F. H.). **Breeding for disease-resistance in Canada. Part III. Horticultural crops and Tobacco.**—*Emp. J. exp. Agric.*, 18, 71, pp. 218–226, 1950.

This is a review, based on the literature, of progress made in breeding for resistance to the principal diseases of potatoes, tomatoes, peas, apples and pears, strawberries, raspberries, currants, tobacco, and miscellaneous horticultural crops in Canada up to the present time. The tomato varieties V–473, introduced in 1946 [*R.A.M.*, 28, p. 493], and Vulcan, introduced in 1950, contain the resistance factors Cf_p1 [ibid., 27, p. 544] and Cf_{sc} and are susceptible to only two of the rarer forms of *Cladosporium fulvum* [ibid., 29, p. 131].

Baillie (A. J.), Freeman (G. G.), Cook (J. W.), & Somerville (A. R.). **Antibacterial and antifungal activity of benztropolone.**—*Nature, Lond.*, 166, 4210, p. 65, 1950.

When spores of *Pullularia pullulans* were suspended in a 0·02 per cent. solution of γ-thujaplicin, all survived after one hour but none after 6 or 24 hours' exposure. In germination tests spores of *Penicillium digitatum* were suspended in a series of concentrations for 18 hours at 25° [C.]. Benztropolone allowed 50 per cent. germination at 80 mg./l. concentration and γ-thujaplicin at 60 mg./l. In a parallel experiment trichothecin [*R.A.M.*, 28, p. 347] completely inhibited germination at 1·25 mg./l. and 50 per cent. germination was obtained at 0·4 mg./l.

After incorporation in a nutrient medium and incubation for five days at 25°, benztropolone completely inhibited all the test organisms at 80 mg./l. and partially inhibited growth at 16 mg./l, while γ-thujaplicin caused only partial inhibition of growth of *Aspergillus niger*, *Mucor erectus*, *P. digitatum*, and *Trichoderma viride* at 80 mg./l. In parallel experiments sodium pentachlorophenate and tetramethylthiuram disulphide inhibited *P. digitatum* and *Fusarium graminearum* [*Gibberella zeae*] completely at 16 mg./l. and partially at 3·2 mg./l.

Both benztropolone and γ-thujaplicin were completely fungicidal to spore suspensions of *Pullularia pullulans* [ibid., 29, p. 448] incubated at 25° for 53

hours. Similar results were obtained with *Trichothecium roseum* in benztropolone solution, while in γ-thujaplicin solution no spores were viable after 33 hours.

WAKSMAN (S. A.). **The Actinomycetes—their nature, occurrence, activities, and importance.**—xviii+230 pp., 29 figs., 9 graphs, Waltham, Mass., The Chronica Botanica Co.; London, W.C. 2, Wm. Dawson & Sons, Ltd., 1950. $5.

In this book the author summarizes the present knowledge of the Actinomycetes by collating the results of his own studies with those of other investigators, greater emphasis being placed on the work achieved in the laboratories of the Department of Microbiology of Rutgers University, and the New Jersey Agricultural Experiment Station.

The chapters cover the following subjects: terminology, phylogeny, and taxonomy; identification and descriptions of more important species; morphology and life cycle, including staining techniques, general morphology, and sporulation; variations and mutations; metabolism; antagonistic properties and the production of antibiotics; distribution; and their action in the decomposition of plant and animal residues, and as causative agents of plant, human, and animal diseases. The composition of various media used in the study of Actinomycetes is given in an appendix. A bibliography of 522 references is provided.

MANIL (P.). **Tumeurs végétales.** [Plant tumours]—*Bull. Inst. Agron. Gembloux*, 17 (*1948–1949*), pp. 26–42, [? 1950].

The author reviews and discusses the pathological aspect of plant tumours caused by fungi, bacteria, viruses, hybridization, and physical and chemical factors. A bibliography of 44 titles is appended.

GREGORY (P. H.). **Deposition of air-borne particles on trap surfaces.**—*Nature, Lond.*, 166, 4220, p. 487, 1950.

Studies on the deposition of air-borne particles on traps in connexion with epidemic disease of crops, made at the Rothamsted Experimental Station, Harpenden [*R.A.M.*, 29, p. 40], showed that the size of the trap itself affects the catch to a greater extent than is generally recognized, as well as particle size and wind velocity. In wind tunnel and open air tests using spores of *Lycopodium clavatum* (approximately 32 μ in diameter) and *Lycoperdon giganteum* (about 4 μ), the percentage efficiency of vertical sticky surfaces was greater for a cylinder than a plate and decreased with the increasing diameter of the trap. With *Lycopodium* superior deposition was obtained as the wind speed was increased from one to over four metres per second. In every case considerably fewer *Lycoperdon* spores were deposited than *Lycopodium*. For horizontal plane surfaces such as glass slides, parallel to the air flow, the principles of deposition were less clear. At wind speeds approaching 10 metres per second as many *Lycopodium* spores were deposited on the lower surface of a horizontal slide as on the upper. Sedimentation under gravity must, therefore, play a minor part except at low wind speeds, and it is suggested that deposition is brought about largely by turbulent flow over the trap surface. The number deposited is, in fact, nearly proportional to the number of spores passing over the surface in a given time, irrespective of concentration. Therefore, although there is a general positive correlation between deposition on a surface and concentration in the air, the trap efficiency varies with conditions, sometimes widely enough to make a direct interpretation misleading.

DUGGAR (B. M.). **Isolation of culturable fungi from diverse habitats.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 12, 5, pp. 168–171, 1950.

The following cultural procedures are briefly described in this paper, which was

presented at a meeting of the Division of Mycology, New York Academy of Sciences, on 24th February, 1950:

A. The dilution series and some modifications, involving nutrient agar, elimination of heat-sensitive organisms, change of pH, elimination of the antibiotic-sensitive organisms, agents differentially deleterious, dye indicators, enrichment of the substratum, and flooding.

B. Special sources of spores or of other viable cells or tissues. (1) Promotion of spore formation. (2) Exudation of gelatinous spore masses. (3) Spore discharge from sporangia, perithecia, apothecia, and so forth. (4) Special cases in plant and animal pathology.

C. The direct transfer method, applicable to the fleshy fungi and rapidly invaded host tissues.

D. The single-cell isolation (not considered here).

E. Special procedures with aquatic fungi [cf. *R.A.M.*, 29, p. 119].

Vanderwalle (R.). **Une méthode optique pour la détection des altérations cryptogamiques internes des pâtes à papier.** [An optical method for detecting internal fungus deterioration in paper pulp.]—*Parasitica*, 6, 1, pp. 1–7, 1950.

The author describes his method of examining the internal fungus microflora of stored paper pulp [cf. *R.A.M.*, 29, pp. 325, 326 and next abstract]. The pulp sheets are examined by transparency against a 500 W lamp augmented by a condenser of 12 cm. diameter to concentrate the rays and secure better penetration. The whole is contained in an iron casing, in front of which is fixed a frame to hold the pulp sheet being examined. They are then photographed, the pulp sheet and a piece of 'Document contact' photographic paper being placed in a printing frame and held in front of the light. Viewed in this way badly deteriorated pulp specimens showed large opaque areas greatly exceeding the zones of deterioration usually visible, while those not apparently deteriorated exhibited numerous internal opaque spots. Only recently manufactured sheets showed no spots at all. It was established that the state of humidity, air inclusions, and superficial moulds or imperfections had no effect upon the image obtained. A thin strip of pulp is cut from the opaque spot, flamed rapidly for surface sterilization, placed on nutrient agar, and incubated. The colonies which grow out come from deep-seated mycelia, not often detected by surface plating methods. The apparatus also enables a distinction to be made between attacks by wood-destroying hymenomycetes and the internal spotting fungi, which cause no alteration in the composition of the pulp but merely interfere with its utilization by matting together the fibres.

Vanderwalle (R.). **Application du test optique à l'étude de pâtes mécaniques de bois altérées.** [Application of the optical test to the study of deteriorated mechanical wood pulp.]—*Parasitica*, 6, 1, pp. 14–20, 1 pl., 1950.

Application of the optical test for detecting deterioration in stored mechanical wood pulp [see preceding abstract] revealed that the following fungi were present; *Phialophora* sp., *Graphium* sp., *Torulopsis* sp., *Trichoderma lignorum* [*T. viride*], *Trichoderma* sp., *Penicillium* sp., *Citromyces* sp. and an unidentified hymenomycete. It is possible by the optical method to correlate the externally visible characters with the type of deterioration present.

The results of a series of experiments carried out at the State Phytopathological Station, Gembloux, indicated that internal deterioration of the pulp during storage develops from micro-organisms incorporated at the time of manufacture, and that further degradation is caused by the development of existing colonies rather than by the appearance of new ones. Areas apparently unaffected by deterioration even

when moulds are visible are overgrown only in very advanced stages of deterioration. They result from the intervention of antagonistic micro-organisms such as *Torulopsis* [*R.A.M.*, 25, p. 7], which inhibits the growth of surrounding organisms. The action of this fungus ceases at high temperatures and when nutrients are reduced. This is followed by the rapid development of the organisms formerly inhibited. Pulp manufactured from diseased wood deteriorates more rapidly than pulp infected at the time of manufacture. The value of the optical test therefore lies in its ability to detect, before any externally visible signs occur, the stage of development of the organisms present and to judge the biological quality of the pulp and its likely reaction to storage.

Brandenburg (E.). **Über die Bildung von Toxinen in der Gattung Pythium und ihre Wirkung auf die Pflanzen.** [On the production of toxins in the genus *Pythium* and their effect on plants.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 5, pp. 69–70, 1950.

A very favourable opportunity for the study of the important phytopathological problem of mutual relationships between host and parasite is afforded by a disease of beets on reclaimed heathland in Germany caused by a *Pythium* of the *irregulare* type. Infection is restricted to the fine roots, through which the highly toxic metabolic products of the fungus are conveyed to the entire plant; poisoning of the leaf cells ensues, eventuating in the development of characteristic symptoms.

The active principle may be readily extracted from liquid cultures by precipitation with 6/10 ammonium sulphate and remains stable after drying. Two precipitations result in a yield of 200 to 250 mg. per l. The most highly purified preparation induced definite injury to beet and spinach leaves within 48 hours at a dosage of only 0·02 mg. per kg.; crucifers were not affected and broad (field) beans, tomato, and tobacco reacted to a moderate extent. The action of the toxin was invalidated in varying degrees by iron, copper, mercury, and silver salts and completely inhibited by oxidizing agents, but was not impaired by reducing substances. There are various indications that the toxin molecule comprises at least two action groups of unequal toxicity levels, differing in their stability in the presence of oxidizing agents, so that it partakes of the nature of an oxidation-reduction system. Hence it follows that the redox potential of the host plasm or the potential of its individual redox systems, as the case may be, plays a decisive part in the development of the reaction between the toxin and plasm molecules; in this way the toxicity of such substances must necessarily differ according to the species or variety of plant attacked. It further appears that the redox processes of the substratum are of crucial importance in promoting vigorous development of the pathogen. Support is lent to this view in particular by the exclusive association of the *Pythium* disease with a special soil type in which the humus elements are still in a more or less reduced state.

Disparities in the pathogenicity of individual *Pythium* strains, not to be reliably distinguished on morphological grounds from the highly pathogenic form, are attributable to difference in the toxicity to the host plasm of the active principles they secrete. The quantitative production of this toxin is extraordinarily heavy in proportion to the mycelial weight of the fungus. The highly pathogenic strains exude this substance into the medium to the extent of 40 to 50 per cent. of their own weight and the fungus is enveloped in a substance of high molecular weight and strong reducing action. It is thus in the position, within certain limits, to furnish its proper medium and adjust weaker, opposed redox systems to its own. Failure to subdue an alien redox system, with the consequent extensive modification of its own 'outer plasm', directly exposes the fungus to the influence of this system, and it may succumb or its development be impeded, while conversely, it may be stimulated by allied redox systems.

Bjørnstad (A.). **Virussjukdommer på Potet i Norge.** [Virus diseases of Potato in Norway.]—*Nord. JordbrForskn., 1948*, pp. 586–590, 1948.

It is reported in this paper read at the Seventh Congress of the Norwegian Association of Land Utilization Research, Oslo, July, 1947, that of the viruses affecting potato in Norway [*R.A.M.*, 18, p. 412], viz., X, Y, A, F [potato aucuba mosaic], and leaf roll, the first-named is by far the most widespread. The most commonly cultivated varieties are carriers of this virus and often thoroughly contaminated. Virus Y is also general but its average incidence is low, and consequently the crop reductions from this source are not so heavy as those due to virus X. The other viruses mentioned above are relatively infrequent.

In respect of control the greatest difficulty in practice is presented by virus X, the symptoms of which are inconspicuous or absent, while its mode of dissemination does not yet seem to be altogether clear. However, virus-free plants can be selected for propagation pending the application of serological methods of diagnosis. Notwithstanding the activity of aphids in the spread of virus Y, it is comparatively easily combated. Most varieties show definite signs of mosaic and rugosity within a week or two of emergence, i.e., during the first half of June over the greater part of the eastern region. The aphids do not normally arrive until the end of the month, so that all foci of infection can be eliminated before the vectors begin to move about. In the writer's laboratory experiments *Doralis* [*Aphis*] *rhamni* proved equally effective with *Myzus persicae* in the transmission of virus Y, thereby confirming the results obtained by Kassanis [ibid., 23, p. 302]. The results of field experiments further corroborated the importance of *A. rhamni* and *D. frangulae* [*A. gossypii*] as carriers of virus Y. In parallel field experiments in the dissemination of leaf roll and virus Y by *M. persicae* and *A. rhamni*, the spread of virus Y was much more extensive than that of leaf roll. In laboratory tests, however, *M. persicae* was four to five times more efficient in the transmission of leaf roll as in that of virus Y. The wider spread of the latter in the field must be attributed, therefore, to contact infection, which has been proved by greenhouse tests to occur between certain varieties, e.g., Epicure and King Edward. In the case of *A. rhamni* the winged spring generation seems to be principally responsible for virus Y transmission. The flights are short, frequently only from plant to plant or covering distances up to 2 or 3 metres, so that transmission is largely concentrated round the focus of infection.

The evidence regarding the capacity of *Macrosiphum euphorbiae* for virus transmission [ibid., 27, p. 441] is conflicting. In the writer's experiments it conveyed virus Y from potato to potato but not to tobacco. After a period of starvation this aphid was nearly as efficient a vector as *Myzus persicae* for some potato varieties but much less so for others. The percentage of infection transmitted by non-starved aphids was barely 2.

Aulacorthum pseudosolani [*Macrosiphum solani*: ibid., 28, p. 301] transmitted up to 80 per cent. leaf roll in laboratory tests. Being much more mobile and active than *Myzus persicae* [ibid., 29, p. 379], it is probably at least as effective as a carrier.

It is clear from these data that in Norway the selection of districts for seed production purposes cannot be based, as in other parts of Europe, solely on the incidence of *M. persicae*.

Lihnell (D.). **Något om förekomsten och spridningen av virussjukdomar på Potatis i Sverige.** [Points about the occurrence and spread of Potato virus disease in Sweden.]—*Nord. JordbrForskn., 1948*, pp. 571–577, 1948.

Some of the information presented in this paper read at the Seventh Congress of the Norwegian Association of Land Utilization Research, at Oslo in July, 1947, on the regional distribution of potato leaf roll virus and virus Y in Sweden [*R.A.M.*,

27, p. 192] may be summarized as follows. The intensity of leaf roll spread declines rapidly from the south to the central and northern parts of the country, and Norrland and north Svealand may be regarded as reasonably 'safe' areas from the standpoint of transmission of this disease. Even further south there is little prospect of any considerable extension in the range of the virus, and apart from the coastal districts from the vicinity of Gothenburg to south-western Scania, the rest of Gothland and Svealand is more or less suitable as a 'sanatorium'. The spread of leaf roll is normally so insignificant that the disease cannot even maintain itself in a potato crop, much less increase in frequency.

On the other hand, active spread of virus Y may take place over practically the whole of Sweden, even as far north as Lulea. The comparative freedom from infection hitherto existing in Norrland must be ascribed, therefore, to the absence of foci of the virus such as are developing with the continuous procurement of new varieties from the south and the use of contaminated material for propagation.

JAMALAINEN (E. A.). **Potatisvirosernas betydelse i Finland.** [The importance of Potato viroses in Finland.]—*Nord. Jordbr Forskn., 1948*, 1–3, pp. 568–570, 1948.

In this paper presented at the Seventh Congress of the Norwegian Association of Land Utilization Research, Oslo, July, 1947, it is reported that virus diseases of potatoes are in general of little consequence in Finland [*R.A.M.*, 27, p. 578]. Even in the south, where they are chiefly encountered, the damage from this source is inconsiderable. As in other countries, weather conditions play an important part in the development of potato viroses, which were favoured by the hot and relatively dry summers of the 'thirties and early 'forties. The change to humidity and coolness of recent years has been accompanied by a remarkable decline in their incidence.

The most prevalent and troublesome of the Finnish potato viroses is streak [virus Y]. *Myzodes* [*Myzus*] *persicae* is largely confined to greenhouses, and is prevented from overwintering by the absence of winter-hardy cabbages. No doubt the virtual freedom from leaf roll of potato crops in Finland is associated with the paucity of these aphids.

Rosafolia [loc. cit.] is almost or entirely immune even at research stations, where the diseases occur with comparative frequency owing to the continuous influx of contaminated material from abroad. The central and northern regions of Finland are very suitable for the production of healthy seed potatoes, which might well become a leading industry in the country.

HEINZE (K.). **Zur Übertragung pflanzlicher Viruskrankheiten durch Blattläuse.** [On the transmission of plant virus diseases by aphids.]—*NachrBl. dtsch. PflSchDienst (Braunschw.)*, 2, 4, pp. 49–53, 1950.

Experimental results are presented showing that in Germany the potato viruses Y [*R.A.M.*, 26, p. 120] and A [ibid., 29, p. 378] are transmitted by *Doralis* [*Aphis*] *rhamni* as well as by *Myzodes* [*Myzus*] *persicae*, and that the Y virus is also transmissible by a form of *D. frangulae* [*A. gossypii*], collected on the winter host *Rhamnus caroliniana*, and by *Macrosiphum solanifolii*. The following were newly demonstrated as vectors of potato aucuba mosaic virus [ibid., 22, p. 90]: *A. rhamni*, *A. gossypii*, *Hyperomyzus lactucae*, *Neomyzus* [? *Myzus*] *circumflexus*, and *Aulacorthum pseudosolani* [*Macrosiphum solani*]. After a few minutes' feeding time at the source of infection the virus is transmissible by the aphids to healthy plants.

At least 26 species are concerned in cucumber mosaic virus transmission [loc. cit.], of which the following are reported for the first time in this capacity: *Anuraphis subterranea*, *Brachycaudus helichrysi* [*A. padi*], *Brevicoryne brassicae*, *Coloradoa tanacetina*, *Dactynotus obscurus*, *D. tanaceticola*, *Doralina urticaria*, *Hyalopterus arundinis*, *Hyphomyzus lactucae*, *Nasonovia* [*Myzus*] *ribicola*, *Pergandeida craccae*,

and *Rhopalosiphoninus latysiphon*. The beet yellows [ibid., 29, p. 549] and beet mosaic [ibid., 18, p. 566] viruses are also transmissible by *Brachycolus atriplicis*.

Ladeburg (R. C.), Larson (R. H.), & Walker (J. C.). **Origin, interrelation, and properties of ringspot strains of virus X in American Potato varieties.**—*Res. Bull. Wis. agric. Exp. Sta.* 165, 47 pp., 14 figs., 1950.

This is a full account of work already noticed from another source [*R.A.M.*, 29, p. 377].

Milovidov (P.). **O nukleální reakci mosaikového viru Bramboru.** [On the nuclear reaction of the Potato mosaic virus.]—*Ochr. Rost.*, 19–20, 10–11, pp. 20–26, 1947. [French summary. Received July, 1950.]

Experiments were carried out in 1943 at the Potato Improvement Institute, Slapy, Czechoslovakia, to determine whether potato virus X contains thymonucleic acid. The virus, isolated from diseased Dianella potatoes, was subjected to Feulgen's nuclear (aldehyde) staining method [*R.A.M.*, 28, p. 135] with negative results. The absence of thymonucleic acid in the crystals of potato virus X and the fact that all plant viruses so far examined are Feulgen-negative suggests that plant viruses do not derive from micro-organisms. On the other hand some bacteriophages and animal viruses gave positive nuclear reactions.

Roland (G.). **Étude préliminaire sur les variantes du virus X (Solanum virus 1, Orton).** [A preliminary study on the variants of virus X (*Solanum* virus 1, Orton).]—*Parasitica*, 6, 2, pp. 51–62, 1 pl., 1950. [Flemish summary.]

In preliminary experiments carried out at Gembloux, Belgium, plants of *Datura stramonium*, White Burley tobacco, *Nicotiana glutinosa*, and *Capsicum annuum* were sap-inoculated with isolates of virus X [*R.A.M.*, 29, pp. 224, 274] from different potato varieties, while King Edward plants were stem-grafted to *D. stramonium*, previously inoculated with the isolates. The results from *D. stramonium* and tobacco indicated the probable presence of Salaman's strains latent X^H, X^G, and X^D [ibid., 28, p. 320] in the various isolates, and of X^L in the isolate from Duke of York; inoculations into *N. glutinosa* showed that the composition of the isolates from Bintje, Dargill Early, and Katahdin differed markedly from those from Duke of York, Eigenheimer, and International Kidney in that the former group caused the development of chlorotic rings while the latter did not. The grafts to King Edward demonstrated that all the isolates contained at least one variant strain to which this variety is hypersensitive and that the isolates from Duke of York and International Kidney contained at least one strain to which King Edward is not hypersensitive.

These experiments established the superiority of the stem grafting method for the identification of the principal variants of virus X in potato plants and stressed the necessity for the clear indication in future of the source of isolates of virus X.

Drobné zprávy. [Brief notes.]—*Ochr. Rost.*, 19–20, 10–11, pp. 158–165, 1 fig., 1947. [Russian summary. Received July, 1950.]

C. Blattný observed in several instances that the incidence of some pathogens in sloping fields is higher in the lower parts than in the higher; for example, a race of *Synchytrium endobioticum* [*R.A.M.*, 25, p. 468], which attacked four potato varieties at a higher level, caused infection of two additional varieties lower down. Further investigations are to be carried out.

In resistance tests in 1946, Chippewa potatoes became severely infected with wart disease (*Synchytrium endobioticum*) in two fields [ibid., 24, p. 114], Pontiac in

one, while Sebago, Houma, Katahdin [ibid., 25, p. 134], and Ontario were not infected.

TEDIN (O.). **Svalöfs Evapotatis (42096). Ny, kraftimmun, mycket tidig sort.** [Svalöf's Eva Potato (42096). A new, wart-immune, very early variety.]—*Sverig. Utsädesfören. Tidskr.*, 60, 2, pp. 215–219, 1950.

The newly developed Swedish early potato variety, Eva, is reported to combine immunity from wart disease [*Synchytrium endobioticum*: *R.A.M.*, 28, p. 191] with fair resistance to blight [*Phytophthora infestans*: ibid., 29, p. 169], especially in the tubers, and to the more important virus diseases. The leaf-rolling sometimes observed is quite distinct from that of virus origin.

MÜLLER (K. O.). **Affinity and reactivity of angiosperms to Phytophthora infestans.** —*Nature, Lond.*, 166, 4218, pp. 392–395, 1 fig., 1950.

Recent investigations at the National Institute of Agricultural Botany, Cambridge, have shown that in the genotypes of potato varieties possessing the highest degree of resistance to *Phytophthora infestans* [*R.A.M.*, 29, p. 529] cell collapse occurs within seven to eight hours after penetration by the fungus at a temperature of 22° C., using potato sprouts. In both resistant and susceptible genotypes this reaction proceeds most quickly in the young sprouts and in the leaves. The cells of the parenchyma of the inner stem, the flower petals, and the tubers generally reacted much more slowly. The behaviour of the host plants when tomato is attacked by the '*S*' strain and '*W*' potato varieties by the '*T*' strain [ibid., 14, p. 390; 15, p. 405] is also characterized by a heightened reaction velocity which appears to be identical in morphological characteristics with that of '*W*' varieties in contact with a common strain of *P. infestans*.

A comparative investigation during 1941 to 1944 of reciprocal crosses between *Solanum demissum* and *S. tuberosum*, showed that there are probably no plasmogenic differences which interfere with the action of the genes involved in the inheritance of resistance to the various strains of *P. infestans*.

In extensive inoculation tests on different parts of various plants it was found that a number of species exhibited a clear affinity to *P. infestans*; of these nine were not members of the Solanaceae. After inoculation with a common strain they all showed reactions which were apparently similar to those observed in plants of the subsection *Hyperbasarthrum* of the genus *Solanum*. Like these they exhibited varying degrees of 'sensitivity' to the fungus. Even the onion possesses tissues which not only can be infected by *P. infestans*, but can also be used as a nutrient substrate for fructification. The correlation between the reaction-speed of the host cells and the behaviour of the parasite is illustrated by tables. All unusual host plants such as *Phaseolus* and *Brassica* behaved in the same manner, irrespective of the strain used, although these strains each exhibited a different behaviour on the '*W*' varieties, *S. demissum*, and *S. demissum* × *S. tuberosum* hybrids. The part of the metabolic system first affected by the invading parasite appears to be common to many angiosperms. From the physiological point of view the specific 'sensitivity' of this functional system, controlled by significant genes, is the decisive factor for the reactive behaviour of the plant.

HOOKER (W. J.), BUCHHOLTZ (W. F.), & COE (D. M.). **You can whip Potato blight.** —*Iowa Fm. Sci.*, 4, 12, pp. 12 (188)–13 (189), 1 fig., 1950.

Various fungicides were tested on Cobbler potatoes in northern Iowa from 1946 to 1949 inclusive for the control of early and late blights [*Alternaria solani* and *Phytophthora infestans*: *R.A.M.*, 29, p. 81]. The former was severe in 1946 and 1948 when it reduced yields by approximately 20 per cent. (60 bush. per acre);

in 1947 the reduction was more than 10 per cent. The incidence of late blight was not serious. In 1946 the highest yields were obtained with 2 qt. dithane D14 plus 1 lb. zinc sulphate per 100 gals. (351 bush. per acre) and 2–100 zerlate (336); in 1947 with the former fungicide (141 bush.) and 2–100 parzate (140), and in 1948 with the same two fungicides (429 each), 4–100 tribasic copper sulphate (427), and 2–100 manganese ethylene bisdithiocarbamate (427); and in 1949 with the last-named (380). The yields of the untreated crops for the four years were 278, 121, 312, and 300 bush. per acre, respectively. When late blight is present copper-containing fungicides should be used.

Jermoljev (E.) & Sethofer (V.). **Zkušenosti nabyté při zjišťování vzdornosti Brambor k aktinomykose.** [Results of Potato scab resistance tests.]—*Ochr. Rost.*, 22, 5–6, pp. 204–225, 1 fig., 1949. [Russian summary.]

Of eight different strains of *Actinomyces* obtained from scabbed potatoes and soils from various localities in Czechoslovakia, No. 6 agreed closely with *A. scabies* [*R.A.M.*, 26, p. 508], No. 3 with *A. albus* var. *cretaceus* [ibid., 29, p. 241], and No. 5 with *A. bicolor* [ibid., 20, p. 259]. At the Větrov Potato Breeding Institute Nos. 1, 2, 3, 4, 5, 6, and 7 were present, at Havlíčkův Brod Nos. 1, 3, 5, 6, 7, and 8, while at Keřkov isolates I, I–1, and I–2 were identical with No. 6 [5 in summary], II with No. 5 (very rare), and III and IV with No. 1. I, I–1, I–2, II, III, IV, 6, and 8 were the most virulent isolates.

In resistance tests carried out in 1947, Krasava, K. Ledvinky, and Bintje were highly susceptible to No. 6, Karát, Marta, and Triumph somewhat less so, while Cardinal was the most resistant. The results of the 1948 tests showed that the various isolates behaved specifically, e.g., No. 3 caused severe infection of K. Ledvinky and Carmen, slight of Bojar, while the other varieties tested (Erstling, Kitting, Cardinal, Krasava, and Triumph) were not attacked; No. 4 infected K. Ledvinky, Bojar, Carmen, and Triumph, and No. 5 Bojar and Triumph, and to a lesser degree K. Ledvinky and Carmen. Cardinal showed a high degree of resistance to all the isolates.

Goidànich (G.) & Pettinari (Carla). **Indagini su una alterazione di incerta natura del tubero di Patata.** [Researches on an alteration of uncertain nature in the Potato tuber.]—*Ann. Sper. agr.*, N.S., 4, 1, pp. 95–101, 2 pl., 1950. [English summary.]

Lesions found on potato tubers and formerly attributed to *Spongospora subterranea* [*R.A.M.*, 27, p. 539] are described. Superficially they appear as round or triangular to quadrangular spots, usually with a distinct hole in the centre, which is often surrounded by a thick rim. They may be inserted on a protuberance caused by hyperplasia of the healthy tissues surrounding the affected parts. In longitudinal sections they appear as thin, cylindrical, straight or twisted canals, hollow or filled with a white powdery substance, and reaching a depth of 2 to 5 mm. in the flesh. The cavities are lined by a continuous, thick, peridermal layer beyond which the tissues of the starch parenchyma are brown to rust-red, the lesion thus appearing to be surrounded by a characteristic, conspicuous halo. The affected tissues contained spherical bodies resembling, but not identical with, those characteristic of the reproductive cycle of *S. subterranea*. They were not confined to any one part of the cell, measured 5 to 12 or more frequently 20 to 30 μ in diameter, and presented a reticulated, vacuolate surface. In nature and in culture these bodies showed no sign of germination. While their precise composition and physiological significance are not yet clear, it is tentatively suggested that they may result from a reaction by the host to injuries caused by insects or Myriapoda. Similar bodies were found, also, in the bud meristems. In some instances the

lesions greatly reduced the commercial value of the tubers. Further investigations are in progress.

Zacha [V.]. **Stříbřitost slupky u Bramborů.** [Silvery skin of Potatoes.]—*Ochr. Rost.*, 22, 5–6, p. 258, 1949.

A considerable number of potatoes harvested in 1948 in Czechoslovakia was affected with the so-called silvery skin [silver scurf] caused by the fungus *Spondylocladium atrovirens* [*R.A.M.*, 29, p. 113]. The author recommends that more attention be paid to this disease, as it is frequently overlooked.

Vielwerth (V.). **Jest možná účinná ochrana proti černání stonků Bramborů a hnilobě hlíz?** [Is effective protection against blackening of Potato stems and tuber rot possible?]—*Ochr. Rost.*, 19–20, 10–11, pp. 28–35, 1 fig., 1947. [Russian summary. Received July, 1950.]

Stem-blackening (black leg) and tuber rot caused by several bacteria collectively called *Bacterium phytophthorum* [strain of *Erwinia carotovora*: *R.A.M.*, 11, p. 261] is one of the most serious potato diseases in Czechoslovakia, but the control has so far been comparatively unsuccessful.

Experiments were carried out in 1941 at Valečov to determine the efficacy of removing diseased plants from the field (a measure strictly carried out in seed potato-growing districts). The apparently normal tubers from Parnassia potato plants carrying severe black leg symptoms were stored and in the spring all were found to be healthy. In May, 1942, the tubers were planted in rather moist, rich soil and only 22 plants from 240 tubers (9·5 per cent.) developed black leg. None of the harvested tubers showed even a trace of bacterial rot. Similar results were obtained at Havlíčkův Brod, where 0·5 per cent. of the plants developed black leg, but all tubers were free from rot.

The author considers affected seed potatoes showing acute infections or external latent ones to be the main sources for disease development. Therefore only healthy, unwounded tubers should be selected after harvest, and overwintered in dry, well ventilated rooms at 0° to 5° C. Other control measures include crop rotation (potatoes should not follow potato, bean [*Phaseolus vulgaris*], carrot, or lupin), destruction of all infected debris, early roguing of diseased plants, and avoiding cold, wet, unaerated soils for planting.

Ruprecht (R. W.). **Minor elements in fertilizers.**—*Agric. Chemicals*, 5, 4, pp. 36–37, 1950.

Minor elements should not be included in fertilizer mixtures unless the manufacturer is preparing them for a specific area or crop and knows how much will be applied per acre per crop. Most soils do not need these elements and others require only one or two. Some are toxic if used to excess and there may be a danger of overdosing. With most minor elements quicker results are obtained with much smaller amounts applied as a spray, and many become unavailable in certain soils when applied as fertilizer. The labour involved in adding minor elements increases the cost of the fertilizer by much more than the cost of the elements themselves.

Zacha (V.). **Puccinia carthami Vda—na Moravě dosud neznámá choroba Safloru (Carthamus tinctorius).** [*Puccinia carthami* Vda—a hitherto unknown disease of Safflower (*Carthamus tinctorius*) in Moravia.]—*Ochr. Rost.*, 21, 1–2, pp. 50–51, 1948. [Latin summary. Received July, 1950.]

In October 1946 safflower plants at the State Breeding Station, Horní Moštěnice, near Přerov, were severely affected by *Puccinia carthami* [*R.A.M.*, 29, p. 172]. This is the first record of the rust in Moravia (Czechoslovakia).

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MYCOLOGICAL PAPERS

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By P. O. Wiehe

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